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PRUTHI (H. S.). **Report of the Imperial Entomologist.**—*Sci. Rep. agric. Res. Inst. New Delhi 1935–36* pp. 123–137, 2 pls., 8 refs. Delhi, 1937.

The work dealt with in this report, which covers the year ended June 1936, was carried out at Pusa ; the Imperial Agricultural Research Institute was transferred to New Delhi towards the end of this period.

The October and ratoon crops of sugar-cane were injured by *Pyrilla aberrans*, Kby., *P. perpusilla*, Wlk., and *P. pusana*, Dist. ; after July the latter was the most abundant. The egg-parasites, *Tetrastichus pyrillae*, Crwf., and *Ooencyrtus pyrillae*, Crwf., occurred in the field in late July ; in one locality the percentage of parasitism increased from 42 in early August to 70 at the end of the month, and in the experimental plot it was 22 in August and (for exposed eggs) ranged between 74·4 and 85 from September to December. Parasitism was higher in eggs on exposed leaves than in those on sheathing leaves, so that periodical removal of the latter should increase natural control. *Dryinus pyrillae*, Kieff., and *Chlorodryinus pallidus*, Perk., parasitised 1–3 per cent. of *Pyrilla*, and *Coniopteryx pusana*, Withycombe, preyed on the eggs. Infestation of sugar-cane by *Aleurolobus barodensis*, Mask., was especially severe in areas where the ratoon crop was grown. Except Co. 299, all varieties of sugar-cane under observation were attacked. Monthly examination of 4,000 canes disclosed a sudden increase of the number of dead-hearts due to borers in July, and in the case of Co. 331 canes from October plantations and ratoon areas, a similar increase occurred in June. Statistical analysis of data on the incidence of pests on the canes Co. 331 and Co. 214 at harvest showed that stem-borers, including *Diatraea* (*Argyria*) *sticticraspis*, Hmps., and *D. venosata*, Wlk., caused most damage to the crop, and then the top-borer [*Scirpophaga nivella*, F.], while the root borer [*Emmalocera depressella*, Swinh.] was harmful only in the early stages of the crop ; damage due to termites was variable. *Apanteles flavipes*, Cam., parasitised 3–5 per cent. of the larvae of *D. sticticraspis* and *D. venosata*, 15–80 parasites developing on each host. About 2 per cent. of *S. nivella* were parasitised by *Rhaconotus scirpophagae*, Wlksn., and 3–15 per cent. of the eggs by an unindentified parasite, possibly *Phanurus* sp. Other pests of sugar-cane included *Proutista* (*Assamia*) *moesta*, Westw., *Diostrombus* (*Drona*) *carnosus*, Westw., and *Macropes excavatus*, Dist., none of which did much damage, and *Trionymus sacchari*, Ckll., which infested an average of 10 per cent. of the plants.

Attempts to transmit leaf-curl of tobacco by nymphs and adults of *Cyrtopeltis tenuis*, Reut. (*crassicornis*, Dist.), and by injecting the plants with the body fluids from the thoracic regions of these bugs, were all unsuccessful. Transmission experiments with *Bemisia gossypiperda*, Misra & Lamba, which had been abundant on sann-hemp [*Crotalaria juncea*] in the previous year, showed that the virus responsible for a leaf-curl disease in this plant produced symptoms of tobacco leaf-curl ("A" type) in tobacco.

In January and February, the flowers of flax (linseed) were again [*cf. R.A.E.*, A **25** 349] infested by the linseed fly [*Dasyneura lini*, Barnes], late-flowering varieties suffering the most ; infestation rose from 5 to 29 per cent. during February on one variety and from 13 to 47 per cent. on another. In the same month, this or a closely related Cecidomyiid infested 1–7 per cent. of 9 out of 33 types of *Cajanus* *indicus* grown at Pusa. In the insectary compound, infestation amounted to 18–53 per cent. The egg, larval and pupal stages on *C. indicus* lasted 2, 6 and 7 days, respectively, at 20°C. [68°F.], and 1, 4 and 5 days at 27°C. [80·6°F.]. Serious damage to seeds of *C. indicus* was caused by *Agromyza obtusa,* Mall., during March. Oviposition occurs in pods in which the seeds are partly formed. In the laboratory, the maximum number of eggs laid by a single female was 50. The egg, larval and pupal stages lasted 2½–3, 9–10 and 8–9 days, respectively, at 27°C. and longer at 18°C. [64·4°F.]. The young larvae feed at the surface of the seed, seldom boring into it, and pupation occurs within the pod. There appear to be several generations in the year. Two larval parasites (*Euderus* spp.) and a hyperparasite were reared.

At temperatures between 80 and 95°F., females of *Calandra oryzae,* L., did not lay eggs when kept at humidities greater than 95 per cent. ; and at humidities less than 50 per cent. they did not feed and died within 3 days. *Aplastomorpha calandrae,* How., was bred from larvae and pupae of this weevil. Neem [*Melia*] cake, a cheap indigenous material, appears to be an effective repellent ; in samples of wheat containing it and stored for a year in small jars, infestation was 2·9–9·4 per cent., and in the control samples it reached 50 per cent.

Apanteles paludicolae, Cam., parasitised a high percentage of the larvae of *Sphenarches caffer,* Zell., which feed on the leaves of cucurbits and *Dolichos lablab* and on the flowers and pods of *Cajanus indicus.* Experiments on the rearing of *Opius fletcheri,* Silv., were carried out with a view to its export to Australia for the control of fruit-flies. At Pusa, its most common host is *Dacus* (*Chaetodacus*) *cucurbitae,* Coq., which chiefly infests *Luffa* spp. In the field, *O. fletcheri* appears in late September and parasitism reaches a maximum of 20 per cent. in October, decreasing to 5·2 per cent. in January. In the laboratory, temperatures of 70 and 77°F. were most favourable to emergence ; at 95°F. neither flies nor parasites emerged.

Observations were made on *Lixus truncatulus,* F., which infests several cultivated varieties of *Amarantus* on the plains of India. At Pusa, the females laid up to 174 eggs, at the rate of 2–3 a day, in the petioles or tender parts of the stem. The larvae hatch in a few days and bore down through the secondary branches to the main stem. Adults may live for 21 weeks, and there appear to be at least 3 generations from March to November, the individuals of the last of which overwinter in all stages. Three Chalcidoid parasites were reared, 2 from the eggs and 1 from the pupae, and a Cecidomyiid larva was found feeding on the eggs.

Records are given of a number of other pests occurring on crops at Pusa, including the following on unusual plants : *Herse convolvuli,* L., on *Phaseolus mungo* ; *Pericallia ricini,* F., on *Luffa* spp. ; *Cyrtopeltis tenuis* on *Sesamum indicum* ; *Dysdercus cingulatus,* F., on *Crotalaria juncea* ; and *Terias hecabe,* L., on *Trigonella foenum-graecum.*

GLOVER (P. M.). **Department of Entomology.**—*Rep. Indian Lac Res. Inst. Namkum 1935–36* pp. 7–18. Calcutta, 1937.

Host-trees of *Laccifer lacca,* Kerr, at Namkum (Bihar) were singularly free from pests [*cf. R.A.E.,* A **24** 243] during the year under review. *Aspidiotus orientalis,* Newst., has been gradually diminishing in numbers, and it caused noticeable damage in only one instance, this being to *Zizyphus jujuba*; it was controlled by cutting and burning the affected shoots. Injury by termites was largely prevented by fumigation of the termitaria.

The 13th generation of the parthenogenetic strain of *L. lacca* [*cf. R.A.E.*, A **24** 243] is developing satisfactorily. Brief notes are given on the natural enemies and hyperparasites of *L. lacca* observed during the year; the only predators were *Eublemma amabilis*, Moore, and *Holcocera pulverea*, Meyr., and no new parasites [*cf.* **23** 746] were recorded. During the past 7 years, the average percentage of parasitism has been 4·8, and in the year under review it was 4·5; the percentage of hyperparasitism also remained low. *Eupelmus tachardiae*, How., a primary parasite of *L. lacca*, occurs also as a parasite of *Microbracon greeni*, Ashm. [**24** 101], *Apanteles tachardiae*, Cam., *Tachardiaephagus tachardiae*, How., and *Erencyrtus dewitzi*, Mahd., and has been bred from the calcareous tubes of the Cercopid, *Machaerota planitiae*, Dist. [**23** 248].

The average percentage parasitism of *Eublemma amabilis* by *Microbracon greeni* was 13·1, as compared with 10·8 in the previous year [**24** 243]. In laboratory experiments in breeding the parasite, mortality was appreciably reduced by providing pith or wood combs with individual cells giving the mechanical support needed by the larvae to aid them in spinning their cocoons. It is thought that increased control of *Eublemma* will be obtained by the liberation of laboratory-bred adults of *M. greeni* at critical periods during the year. Unsuccessful attempts were made to induce *Apanteles tachardiae* and *Pristomerus testaceicollis*, Cam., important endoparasites of *Holcocera pulverea*, Meyr., to oviposit in the laboratory. A consignment of *Microbracon hebetor*, Say, was received from Ceylon, and 6 generations were successfully bred by the end of the year. The original adults and those of the F_1 generation appeared to breed more readily on larvae of *Ephestia kuehniella*, Zell., than on *E. amabilis* or *H. pulverea*, but later generations were satisfactorily reared on the larvae of these predators. The parasite has been successfully established in association with lac in one district. Experimentally, it also bred freely on larvae of *Platyedra gossypiella*, Saund. [*cf.* **24** 483].

RAMAKRISHNA AYYAR (T. V.) & ANANTANARAYANAN (K. P.). **The Stem-borer Pest of Rice** (*Schoenobius incertellus* **W.**) **in S. India.**—*Agric. Live-stk India* **7** pt. 2 pp. 171–179, 15 refs. Delhi, March 1937.

This account of the bionomics and control of *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.) (paddy stem-borer), which infests rice throughout the tropical regions of Asia, is based partly on the literature and partly on the authors' observations in southern India. The female lays eggs in masses of 60–100 on the tender leaves of rice. The larvae, which are briefly described, hatch in 5–6 days and enter the plant stem, where, later, pupation occurs. The larval and pupal stages last 4–5 weeks and 10 days, respectively. Rice appears to be the only food-plant, and it seems that three broods may be completed in the course of a single crop, although only the last two have been observed closely. The damage, which amounts to 3–65 per cent. in southern India, is shown by dead-hearts or, in a crop with ears, by white ears. Infestation is more severe in double-cropped areas, where the generations overlap, than in single-cropped ones, where the moths appear a month after planting and there are at least two generations before harvest. It is heaviest in the second crop in areas of heavy rainfall; apparently crops in standing water or in very moist conditions are more suitable for oviposition. Attack in an early stage of growth may necessitate re-sowing. Over 1,000 types of cultivated rice were tested for resistance, but none was free from borers, and infestation of the different varieties was relatively inconsistent from year to year.

In southern India, the larvae are parasitised by *Ischnojoppa luteator*, F., *Goryphus maculipennis*, Cam., *Tropobracon indicus*, Ram., and *Apanteles schoenobii*, Wlkn., and the eggs by *Tetrastichus schoenobii*, Ferrière, *Trichogramma minutum*, Riley, and *Phanurus beneficiens*, Zehnt. Among the control measures discussed are hand-collection of the egg-masses, which is ineffective; removal of dead-hearts, which apparently only contain a small percentage of the larvae; destruction of stubble after harvest by ploughing or burning [*cf.* *R.A.E.*, **18** 463], and the use of light-traps [*cf.* **22** 684], which are recommended.

BOURGOGNE (J.). **Description de deux Psychidae nouvelles de Cochinchine nuisibles au** *Nipa fruticans* **(Lep. Hétérocères).**—*Bull. Soc. ent. Fr.* **42** no. 4 pp. 55–62, 15 figs. Paris, 1937.

Descriptions are given of all stages of *Acanthopsyche* (*Cremastopsyche*) *nipae*, sp. n., and *A.* (*Metisa*) *griseoalba*, sp. n., both of which attack *Nipa fruticans* in Cochin China. The adult female of *A. nipae* never leaves the cocoon and lays 40–60 eggs within it. The larvae, which hatch after 10–14 days and are gregarious at first, feed on the palm leaves and pass through 4 instars. Pupation takes place in a cocoon to which scraps of the leaves are attached and which is suspended at the end of a short strand of silk. The life-cycle is completed in about 45 days, and breeding continues throughout the year. The habits of *A. griseoalba* are very similar to that of *A. nipae*, but the duration of the life-cycle is thought to be longer. The cocoon is attached to the end of a stiff silken thread that is bent at an angle. Parasitism of both species by *Apanteles* and by undescribed Cecidomyiids is of frequent occurrence.

DE FLUITER (H. J.). *Orphinus* **spec., een Dermestide, schadelijk voor tabakszaad.** [*Orphinus* sp., a Dermestid injuring Tobacco seed.]—*Meded. Besoekisch Proefst.* no. 56 pp. 25–34, 2 pls., 5 refs. Surabaya, 1937. (With a Summary in German.)

In 1936, larvae, pupae and adults of a Dermestid of the genus *Orphinus* were found in a sample of tobacco seed in a fabric bag in Java. The larvae were successfully reared in tobacco seed, which they damaged considerably, but did not feed on the material of which the bag was made, though, at Buitenzorg, Kalshoven had found adults and larvae feeding on the cloth binding of old portfolios. The egg, larva and adult are described. In tobacco seed, the egg stage lasted 10 days, the larval 92–215 and the pupal 4–5 (8 in one instance). The male larvae moulted 6–8 times, and the females 8–12 times. The adult beetle remained in the pupal case for 2–6 days after it had split.

CHEO (Ming-tsang). **A preliminary List of the Insects and Arachnids injurious to economic Plants in China.**—*Peking nat. Hist. Bull.* **11** pt. 3 pp. 281–286. Peiping, March 1937.

This list, which is a continuation of previous ones [*R.A.E.*, A **25** 231, etc.], comprises 43 Pyralids and records the plants they attack and their distribution in China.

INOUYE (M.). **One new and two unrecorded Species of Aphididae from Japan.**—*Insecta matsum.* **11** no. 3 pp. 100–105, 1 fig. Sapporo, March 1937.

The species recorded are *Cinara nopporoensis*, sp. n., *C. vanduzei*, Swain, and *Lachniella costata*, Zett., all from spruce [*Picea* spp.] in Hokkaido. The winged and wingless viviparous females, the oviparous female and the winged male of the new species are described.

JONES (E. P.). **Entomological Review, 1935.**—*Publ. Brit. S. Afr. Co.* no. 5 pp. 3–10. London, 1936. [Recd. May 1937.]

Insect damage to the 1935 crop of *Citrus* on the estates of the British South Africa Company in Southern Rhodesia was rather greater than that to the previous one [*cf. R.A.E.*, A **24** 609], but was not severe, in spite of an outbreak of *Heliothis armigera*, Hb. (*obsoleta*, F.) [*cf.* **24** 610]. Drought conditions from late January to early March precluded the development of a large population of the red scale (*Aonidiella aurantii*, Mask.), infestation being the lowest since 1932. Some damage was done by fumigation with hydrocyanic acid gas, the fruit being much more seriously affected than the foliage ; as the concentration was the same as that used in the past, it is thought that drought had produced an abnormal physiological condition in the trees, making them particularly susceptible to injury.

JONES (E. P.). **The Bionomics and Ecology of Red Scale**—*Aonidiella aurantii*, **Mask.—in Southern Rhodesia.**—*Publ. Brit. S. Afr. Co.* no. 5 pp. 11–52, 7 figs., 1 pl., 8 refs. London, 1936. [Recd. May 1937.]

An intensive study is described of the bionomics and ecology of *Aonidiella aurantii*, Mask., at Mazoe in Southern Rhodesia, where it is a major pest of *Citrus* and also attacks rose, mulberry and *Salix babylonica*. Further observations on trees in neglected groves demonstrated the positive correlation between tree vigour and scale population [*cf. R.A.E.*, A **22** 79]. Apart from field observations, studies on the development and productivity of the scale were conducted on orange fruit and lemon seedlings in a screened and roofed insectary, where daily records of temperature and relative humidity were kept throughout the investigation.

The development of the female includes two instars, each terminated by a moult, and a third stage, in which development is completed and is followed, if fertilisation has occurred, by a period of maturation. The third stage is generally longer than the combined first and second instars. In the male, there are three moults, a prepupal and pupal stage following the second instar. The males usually emerge as winged adults 1–2 weeks after females of the same age have moulted for the second time. The average period required for their complete development varied with the time of the year from 30 to 68 days on fruit and 33 to 81 days on leaves. The corresponding periods for the female life-cycle (including the period of embryonic development) were 77·2–137·4 and 90–167·2 days. Development in both sexes was most rapid in October and November, when the temperature is high and the humidity low, and was considerably retarded during the winter. There was a definite correlation between temperature and rate of development, the effect increasing with age [*cf.* **20** 138]. The thresholds of development for males and females were 12·5 and 12·3°C. [54·5 and 54·14°F.] with thermal constants of 360 and 648 day-degrees C. [648 and 1166·4 F.] on fruit, and 12·9 and 12·8°C. [55·22 and 55·04°F.] with thermal constants of 397 and 690 day-degrees C. [714·6 and 1242 F.] on leaves. This difference in the rate of growth on fruit and leaves may be due to a difference in eco-climates. A chart shows the hyperbolae of female development at varying temperatures on fruit in California and at Mazoe, and on leaves at Mazoe and in Palestine [*cf.* **20** 138 ; **22** 554]. The fruit hyperbola from Mazoe is very similar to that from California and the leaf hyperbola to that from Palestine, though in the first case the rate of growth is slower and in the second more rapid. The thermal constant for females on fruit exceeds that from California by about 80 day-degrees C. [144 F.]. The threshold of development for males in Palestine was only 7·5°C. [45·5°F.] as compared with 14°C. [57·2°F.] for females.

Exhaustive experiments showed that fertilisation is essential for reproduction [*cf.* **22** 673], and that if it is delayed, the female remains in a state of physiological inactivity, the third stage being considerably prolonged. In this sex the duration of adult life (the total time from the second moult to death) varied from 80 days in summer to about 155 in winter. Most males die within 2 days of emergence. The rate of reproduction varied with the temperature and humidity ; optimum conditions were 72–76°F. and 62–69 per cent. on fruit, and 71·5–77·5°F. and 65–72·5 per cent. on leaves. It was highest on fruit in January, when an average of 6·76 crawlers per day was produced. The rate on leaves was constantly lower throughout the year, but exhibited the same seasonal variation. The total number of crawlers per female averaged 73·2 on fruit and 63·0 on leaves, the maximum being reached in January, February and March, when the average production periods were 32·7 and 41 days, the corresponding periods in winter being about 50 per cent. longer. The average production of crawlers per female in Palestine and California was 72·6 and 62·1 on fruit and 51 and 41·1 on leaves, the figures for these countries representing only part of the year. If it is assumed that a third of the number of embryos still in the body of the female at death under experimental conditions would be produced normally under field conditions, the average total production on fruit and leaves at Mazoe would be 87·7 and 78·5. Figures of total production calculated for Palestine [**22** 554] were based on the assumption that all embryos would emerge under field conditions, and this is considered unlikely.

The mode of reproduction is discussed [*cf.* **22** 673, etc.] ; in the author's observations it was viviparous, with only rare instances of so-called ovoviviparity. The young may remain beneath the parent scale from 30 minutes to over two days after birth. They wander about from a few to 48 hours before settling, when they begin to feed and become whitecaps [*cf.* **24** 779]. As the cap becomes more compact and a prominence is left in the centre, they are said to enter the nipple stage. The percentages of crawlers that settled throughout the year were 65·1 on fruit and 59·4 on leaves. Experiments showed that temperature was the predominant factor and that optimum conditions were 23–25°C. [73·4–77°F.] and a relative humidity of 65–80 per cent. Determinations from settled larvae showed that the proportions of the sexes were almost equal. The percentages of mortality during development, determined experimentally from females settled on fruit and leaves, were 31·4 and 39·8 in the summer and 56·4 and 72·4 in the mild winter of 1934. Under field conditions mortality would be considerably higher owing to leaf drop, fruit picking, etc.

At Mazoe there were 5 generations annually in the shade and 6 or 7 in direct sunlight. From the economic point of view, the most important development periods are September, mid-November to mid-December, mid-January to mid-February, and mid-March to mid-April, while from the end of May to early August the population is at its minimum. Under shade conditions, scales developing in the winter give rise to the first generation in late September, and the population is at its maximum in late March or in early April, when the fruit has reached a suitable size for infestation.

The most satisfactory control has so far been obtained with hydrocyanic acid gas applied by the Cyanofumer method, but trials are being carried out with liquid HCN. Further tests with proprietary oil sprays are also being made, as at present the only strengths effective against the scale are injurious to the foliage of young trees. In Southern Rhodesia, fumigation of bearing trees can be undertaken only from mid-April to early July, and it is suggested that, if a satisfactory spray could be found, young trees should be treated then and also in September, or at the latest in November or early December.

Wind is thought to be the only important factor in the dispersal of crawlers and consequently in reinfestation after fumigation.

The only insect parasite of *A. aurantii* that has been recorded at Mazoe during the last 8 years is the Aphelinid, *Aphytis chrysomphali*, Merc., but the average parasitism for two years was only 1–2 per cent. A list is given of several Coccinellids observed feeding on the scale, but as none was a specific predator, they also were of little value.

McKeown (K. C.). **The Cup Moths.**—*Aust. Mus. Mag.* **6** no. 5 pp. 149–151, 2 figs. Sydney, 1937.

Of the 35 species of Limacodids of the genus *Doratifera* recorded from Australia, *D. oxleyi*, Newm., is sometimes a serious pest in the red gum [*Eucalyptus*] forests along the rivers in south-western New South Wales, defoliating the seedlings for distances of many miles. Usually, however, its numbers are kept down by Hymenopterous parasites. As many as 60–70 eggs may be laid on the surface of a single leaf in 4 or 5 diverging rows. The larvae feed on the leaves, leaving only the midribs, and pupate in cocoons on the twigs. The moths emerge in spring. The larvae have urticating spines that cause intense irritation if touched, but do not break off and enter the flesh as do the hairs of processionary caterpillars [*Thaumetopoea*] and similar larvae.

PASQUIER (R.). **Le criquet marocain en Algérie.**—*L'Agria, Rev. mens. Ass. anc. Élèves Inst. agric. Algérie* nos. 53–55 repr. 14 pp. Algiers, April–June 1937.

The known outbreak centres of *Dociostaurus maroccanus*, Thnb., in Algeria [*R.A.E.*, A **22** 702] are recorded. The outbreak area extends through a semi-arid zone, at an altitude of 1,300–3,300 ft., and with an annual rainfall of 13–16 ins. The outbreak centres, the typical vegetation in which consists of *Poa bulbosa, Stipa tortilis* and *Bromus* spp., are usually associated with saline soils, abandoned ploughed fields, uncultivated deforested areas, and overgrazed steppe-land [*cf.* **22** 242].

During the last few years, energetic control by means of poison baits, has been carried out against the phases *solitaria* and *congregans*. The organisation of the control is outlined ; in future it should be directed against the phase *congregans* only, for the destruction of the harmless phase *solitaria* is both difficult and costly. The average annual cost of such control is estimated at half a million francs, as compared to the average annual expenditure of ten million francs in the campaigns during the outbreak period of 1925–30.

MARTELLI (G. M.). **Contributo alla conoscencenza biologica del** *Dacus oleae* **Rossi e dei suoi parassiti in Tripolitania (Nota preliminare).** [A Contribution to the biological knowledge of *D. oleae* and its Parasites in Tripolitania. (Preliminary Note.)]—*Agric. libica* **6** no. 3–4 repr. 9 pp., 1 fig. Tripoli, 1937. Also in *Agric. colon.* **31** no. 4 pp. 149–155, 2 figs. Florence, 1937.

The percentage of parasitism of pupae of *Dacus oleae*, Gmel., bred from infested olives collected in Tripolitania in August and September varied, with the variety of olive, from about 0·3 to 15·5 per cent. Of the 261 parasites obtained, 256 were *Opius concolor*, Szepl., the other 5 belonging to the genera *Eulophus, Eurytoma* and *Eupelmus*. It is possible that *O. concolor* is of some value in reducing the numbers of the fly, infestation of olives not having been so severe during the past eight years in Tripolitania as it is in southern Italy. Parasitism by *Opius* was greatest in varieties of olive with a thin pulp (2–2·5 mm. thick) and least in those with a thick pulp (6–7 mm.) ; it is probable that the ovipositor of the female, having an average length of 2·25 mm., is better able to reach the host larva in an olive with a thin pulp. This view is supported by a suggestion in a work already noticed [*R.A.E.*, A **22** 308] that the very low rate of parasitism (2 per cent.) of *Dacus ciliatus*, Lw. (*brevistylus*, Bezzi) in melons in Italian Somaliland by *Diachasma brevistyli*, Paoli, is due to the latter being unable to reach most of the larvae.

BARANOV (N.). **Maslinova mušica.** [The Olive Fly.]—Med. 8vo, 16 pp., 7 figs. Zagreb, Škola narodn. Zdravlja, 1937.

An account is given of the bionomics of *Dacus oleae*, Gmel., based on four years' observations on the island of Pago, off the coast of Dalmatia, where olives are intensively cultivated and where they were severely infested in 1936. The adults appear in small numbers in olive plantations at the beginning of July, and the fact that young olives become infested at this time, although all the flies caught in trap dishes were young females with undeveloped ovaries, indicates that the older females only remain a short time on the trees. The flies are numerous at the end of July or beginning of August, and again in the second half of August. They often occur outside the olive plantations and only return to them to oviposit. In August and September, they are numerous on fig trees, and feed on the juice of the ripe fruits. The maximum daily number of eggs that a female lays is 8–10 in hot weather without wind or rain. From the beginning of September, when the weather becomes cooler, the flies are no longer attracted to cultivated olives, but oviposit on wild ones, which are abundant in Pago and have large fruits. There are several generations a year, and larvae and pupae occur in cultivated fruits up to the time of picking ; the larvae abandon picked fruits and pupate in the soil, but those in the fruits that are left on the trees pupate within them. In the case of wild olives, the larvae always pupate in the soil and hibernate. The adults emerge in the spring, but their habits before they appear on cultivated olives in July have not been ascertained. Effective control was obtained in experiments with a bait-spray prepared by dissolving 3 oz. sodium arsenite and 6¼ lb. molasses in 5 pints boiling water and diluting with 5 gals. water. The trees should be sprayed as high up as possible, particularly on the south-west side, where the flies chiefly congregate. Four applications are recommended, the first as soon as the flies appear in the plantations, probably at the end of June, and the others about 20th July, 15th August and the end of August or beginning of September, respectively. Fig-trees growing among the olives should be either destroyed or isolated by repeated spraying of the adjoining olives. Wild olives should preferably be grafted or else sprayed. As the flies are only slightly attracted by molasses and discover it accidentally, the chances of control increase in proportion as a greater part of the tree is sprayed. Experiments showed that the percentages of infested fruits on trees untreated, sprayed on one side and sprayed on all sides, respectively, were 99–100, 65 and 14·5.

Menozzi (C.). **Osservazioni e note entomologiche sulla campagna saccarifera 1936.** [Entomological Observations and Notes on the Sugar-beet Season in 1936.]—*Industr. saccar. ital.* **30** no. 3 repr. 7 pp. Genoa, March 1937.

In 1936 conditions in Italy were for the most part unfavourable to the insect pests of sugar-beet. The losses due to *Cassida vittata*, Vill., *C. nobilis*, L., and *Chaetocnema tibialis*, Ill., were generally slight and less than those caused by *Cleonus mendicus*, Gyll. Trap rows of beet proved of value against this weevil, which usually leaves its winter quarters a few days before the beet plants appear. For this purpose beets are taken at harvest time, their leaves are cut down to about half an inch, and they are stored in sand until early spring, when they are planted, 10–15 yards apart, in a row round the beet field, generally 20–25 days before the beet is sown. Up to 200 weevils have been taken round one of these trap beets.

Aphis rumicis, L., occurred wherever beet was grown for seed, but did little harm as it was largely controlled by 30 natural enemies, of which the most active were the parasites, *Charips pusillus*, Kieff., *Lysiphlebus dissolutus*, Nees, and *Pachyneuron aphidis*, Bch., and the predators, *Coccinella septempunctata*, L., *Scymnus apetzi*, Muls., *Syrphus balteatus*, DeG., *Sphaerophoria scripta*, L., and *Leucopis magnicornis*, Lw. Against *Lixus junci*, Boh., which was not abundant, about 6,000 parasites of species absent in northern Italy were liberated near Ravenna and Cesena [*cf.* *R.A.E.*, A **22** 202]. Little harm was done by *Phthorimaea ocellatella*, Boyd, which also attacks seed beet. In central Italy, it has three generations a year, the third hibernating in the pupal stage. In northern Italy, most of the second-generation pupae hibernate [*cf.* **24** 362], but a few third-generation larvae are produced. These overwinter and pupate in spring, the adults emerging at about the same date as those from the hibernated pupae. The Cryptophagid, *Atomaria linearis*, Steph., which is frequently observed on beet, lives on the vegetable débris on the collar before hibernation and becomes phytophagous in spring.

ACZÉL (M.). **Trypetiden Studien.** [*In Magyar.*]—*Állatt. Közlem.* **34** no. 1–2 pp. 80–82. Budapest, 12th April 1937. (With a Summary in German.)

In 1936 the author took numbers of *Trypanea* (*Trypeta*) *amoena*, Frfld., from flowers of lettuce (*Lactusa sativa*) in Hungary. The larvae cause serious damage to the seeds.

HAMPP (H.) & JEHL (J.). **Blattlaus-Bekämpfungsversuche auf dem Hopfenversuchsgut Hüll 1934–1936.** [Experiments in combating Aphids at the Hüll Hop Experiment Station, 1934–36.]—*Prakt. Bl. Pflanzenb.* **15** no. 1–2 pp. 13–20. Freising, 1937.

The course of infestation of hops by Aphids [*Phorodon humuli*, Schr.] at the Bavarian experiment station at Hüll is surveyed briefly for the years 1927–33 and in greater detail for 1934–36. A table shows the differences in the degree of infestation in different varieties of hops on 8th September 1935. In insecticide tests, derris and nicotine dusts proved ineffective, but good results were obtained with a number of sprays, including 2 per cent. soft soap, and very good results with a spray of 0·5 per cent. tobacco extract (containing 8–10 per cent. nicotine) and 1·5 per cent. soft soap, or one containing 0·1 per cent. nicotine and 0·5 per cent. soft soap. Such sprays should only be applied before the umbels begin to form, but a 1–1½ per cent. solution of soft soap can be used during the first third of the time that the umbels are forming without risk of scorching.

LEMCHE (H.). *Geophilus carpophagus* **Leach als Hausschädling in Dänemark.** [*G. carpophagus* as a House Pest in Denmark.]—*Anz. Schädlingsk.* **13** no. 5 pp. 57–60, 8 refs. Berlin, May 1937.

Since 1903, several cases of infestation of old houses in rural areas in Denmark by the Chilopod, *Geophilus carpophagus*, Leach, have been recorded. These centipedes are rare in summer, but become more numerous in October and again in February and March, emerging by night from behind damp skirting boards, etc., and running about on bedding. In two instances, they were observed near bread and meat, but it is not known whether they fed on them.

KRIEG (H.). **Auftreten des Hausbocks in Pfahlwerken.** [The Occurrence of *Hylotrupes bajulus* in Piles.]—*Anz. Schädlingsk.* **13** no. 5 pp. 63–64, 2 figs. Berlin, May 1937.

The occurrence is recorded of *Hylotrupes bajulus*, L., in mooring piles in Hamburg, the larvae being found upwards of 3 ft. above the normal high water mark.

GANTE (T.). **Zur Biologie des Pflaumenwicklers,** *Grapholitha funebrana* **Tr.** [A Contribution to the Biology of *Cydia funebrana*.]—*Anz. Schädlingsk.* **13** no. 5 p. 65. Berlin, May 1937.

In 1934 and 1935, the author observed that *Cydia* (*Grapholitha*) *funebrana*, Treit., produced two generations a year on plum in southern Germany, as it does in Switzerland [*R.A.E.*, A **22** 432].

PEUS (F.). **Fliegenmaden in Tafelsenf.** [Fly Larvae in manufactured Mustard.]—*Z. hyg. Zool. u. SchädlBkampf.* **28** no. 9 p. 141, 1936. (Abstr. in *Anz. Schädlingsk.* **13** no. 5 pp. 66–67. Berlin, May 1937.)

Samples of manufactured mustard from a German factory were found to be infested by Dipterous larvae, including *Fannia scalaris*, F., *Leptocera* sp., and *Mydaea* sp. Oviposition had probably taken place on the package, the larvae then making their way to its contents.

BUSNEL (R. G.). **Contribution à l'étude anatomique et physiologique de la chenille d'***Ephestia kuehniella* **Z. (teigne de la farine).**—*Rev. Path. vég.* **24** fasc. 2 pp. 137–162, 4 pls., many refs. Paris, 1937.

This paper deals with observations on the flour moth, *Ephestia kuehniella*, Zell., in France and includes a brief summary of its bionomics, an account of the anatomy, histology and physiology of the larval digestive tract, and short notes on a protozoan parasite, *Gregarina ephestiae*, which frequently occurs in the small intestine. Experiments on the growth rate of the larvae showed that they could mature in bean, lentil or pea flour, though less rapidly than in natural cereal flour. They were unable to complete development on flour from which the vitamins had been eliminated by treatment with either heat or X-rays [*cf. R.A.E.*, A **14** 410], and did not feed on cassava flour or mustard powder, pure starch or gluten.

BONNEMAISON (L.). **Un aphide nuisible aux fougères nouveau pour la France.**—*Rev. Path. vég.* **24** fasc. 2 pp. 163–171, 8 figs., 7 refs. Paris, 1937.

Descriptions are given of the winged and wingless parthenogenetic females of *Idiopterus nephrolepidis*, Davis, which was recently found for the first time in France, where it was observed attacking a fern (*Adiantum capillus veneris*) in a Bordeaux market. A list is given of the food-plants of this Aphid and the countries from which it has been recorded.

Brémond (P.). **Observations sur** *Chortophila brassicae* **Bché., et son parasite** *Aphaereta minuta* **Nees au Maroc.**—*Rev. Path. vég.* **24** fasc. 2 pp. 172–174. Paris, 1937.

Breeding experiments and field observations on *Phorbia* (*Chortophila*) *brassicae*, Bch., infesting turnips and radishes in Morocco showed that the main diapause occurred in the summer (which is very dry) instead of in the winter as in Europe. In the course of a year, adults of successive generations emerged in February, March, April, June, October, November and January. Some of the larvae from eggs laid in April gave rise to adults that emerged in June, while others did not do so until October. A complete summer diapause also occurred in the most important parasite, a Braconid, *Aphaereta minuta*, Nees, and it had only 6 generations annually, as no adults emerged in June, though in the other 6 months they emerged on almost the same dates as those of their host.

Cameron (A. E.). **Insect and other Pests of 1935.**—*Trans. Highl. agric. Soc. Scot.* 1936. repr. 41 pp., 39 figs. Edinburgh, 1936.

More than half this report consists of notes on the bionomics of the commoner insect pests recorded on crucifers in Scotland in 1935, viz., *Contarinia nasturtii*, Kieff., *Phorbia brassicae*, Bch., *Ceuthorrhynchus quadridens*, Panz., *Plutella maculipennis*, Curt., and the Aphids, *Brevicoryne brassicae*, L., and *Myzus persicae*, Sulz., together with brief descriptions of various stages of them and suggestions for their control. A summary is given of the author's observations [*R.A.E.*, A **24** 791] on *Chermes* (*Adelges*) *cooleyi*, Gill., attacking spruce and Douglas fir [*Pseudotsuga taxifolia*]. Damage to turf on bowling greens was caused by *Dilophus febrilis*, L., and to pasture on a farm by *Bibio lacteipennis*, Zett. ; these Bibionids could be controlled by methods recommended against Tipulids [*cf.* **20** 541].

The Principal Pests and Diseases of Crop Plants in the USSR (Survey for 1935). [*In Russian.*]—Roy. 8vo, 432 pp., 12 diagr., 20 maps. Leningrad, Lenin Acad. agric. Sci., Inst. Plant Prot. 1936. Price 12 *rub.*

This work comprises a series of papers by different authors in which are collated data on the prevalence of pests and diseases of plants in various parts of the Russian Union in 1935, with a view to indicating the probability of outbreaks in 1936. The papers are grouped into sections dealing, respectively, with grain crops, cotton, sugar-beet, vegetables, hemp, flax, and fruits. Insects that are the subjects of separate papers are : locusts and grasshoppers ; *Loxostege sticticalis*, L., and *Euxoa segetum*, Schiff., on sugar-beet ; *Psylliodes attenuata*, Koch, and *Pyrausta nubilalis*, Hb., on hemp in the forest-steppe zone ; and *Plusia* (*Phytometra*) *gamma*, L., on flax. The papers on the last four of these pests deal with their prevalence in European Russia only. In that on *P. nubilalis*, which is by L. A. Laduizhenskaya, it is stated that the larvae are parasitised by the Braconids, *Macrocentrus abdominalis*, F., *Microgaster globata*, L., *Meteorus deceptor*, Wesm., *Chelonus annulipes*, Wesm., two species of *Apanteles*, and *Triaspis* (*Sigalphus*) *pallidipes*, Nees, the Ichneumonids, *Eulimneria alkae*, Ell. & Sacht. (*crassifemur*, auct.), *E. rufifemur*, Thoms., *E. geniculata*, Grav., *Angitia punctoria*, Rom., *Phytodietus segmentator*, Grav., and *Pimpla roborator*, F., the Eulophid, *Eulophus viridulus*, Thoms., and the Tachinids, *Zenillia* (*Exorista*) *mitis*, Mg., *Ceromasia senilis*, Mg., *Tachina* (*Larvaevora*) *noctuarum*, Rond., and *Nemorilla* (*Thyella*) *floralis*, Fall., and that the Ichneumonid, *Hygrocryptus carnifex*, Grav., has been reared from the pupae.

KING (K. M.) & VIGOR (S. H.). **Grasshopper Control in Saskatchewan.**—*Bull. Dep. Agric. Saskatchewan* no. 87, 11 pp., 1 fig. Regina, 1937.

Grasshopper infestations of stubble lands should be controlled by summer-fallowing in such a manner as to concentrate the grasshoppers in a central portion [*R.A.E.*, A **24** 144] where they can be killed with poison baits, which can be successfully used against both hoppers and adults. Care should be taken to apply bait only when the insects are feeding, *i.e.*, in the morning when the shade temperature reaches 68°F., and again in the afternoon. The grasshoppers hatching outside cultivated land should be similarly poisoned; their migration to the crops can be delayed by leaving one drill width unsown and free of weeds round the edge of the field.

Egg-infested stubble land intended for a crop should be ploughed to the depth of five inches, provided that the soil is moist enough to be completely turned over and packed down. In cases of light infestations, or in heavily infested stubble intended for summer-fallowing, shallow disking is recommended. Where severe outbreaks of the pale western cutworm [*Porosagrotis orthogonia*, Morr.] are anticipated, the soil should not be disturbed until the middle of September. To ensure a supply of fodder during heavy infestations, oats and barley should be sown on summer-fallow; maize forms good fodder as it shows a high degree of resistance to attacks of grasshoppers. Early sown crops have the best chance of escaping serious injury.

PATCH (L. H.). **Resistance of a single-cross hybrid Strain of Field Corn to European Corn Borer.**—*J. econ. Ent.* **30** no. 2 pp. 271–278, 1 fig., 2 refs. Menasha, Wis., April 1937.

The resistance to natural infestation by *Pyrausta nubilalis*, Hb., of two single-cross hybrid strains of maize, one of which had appeared to be more resistant than the other to artificial infestations in tests in 1931–35, was compared in Ohio in 1936. The two strains took approximately the same time to reach given stages of development and had about the same area of leaf surface. The numbers of egg-masses laid on plants of the two strains were about the same, but the number of larvae reaching maturity in those of the resistant strain was only 46·6 per cent. of the number doing so in those of the susceptible strain. When there were 1, 2, 3 and 4 egg-masses in each group of about 3 plants, the numbers of borers in plants of the former strain represented 71, 56·6, 37·6 and 48·2 per cent., respectively, of those in plants of the latter. Past experiments indicated that the resistance of the superior strain was similarly greater than that of local open-pollinated varieties of maize. Over a period of 5 years, the resistant strain gave a yield of 9 bushels per acre more than the mean yield of all the strains in the test.

Ellisor (L. O.) & Graham (L. T.). **A recent Pest of Alfalfa.**—*J. econ. Ent.* **30** no. 2 pp. 278–280, 3 refs. Menasha, Wis., April 1937.

During the late summer and autumn of 1936, lucerne in Louisiana was defoliated by *Anticarsia gemmatalis*, Hb., which has been present in the State as a pest of soy beans and to a smaller extent of velvet beans [*Stizolobium*] every year since 1929 [*R.A.E.*, A **18** 678, 679].

Eggs were also deposited and larvae completed their development on the leaves and stems of *Phaseolus latheroides* planted between varieties of soy beans, and ground-nuts some distance away were defoliated. The larvae were observed in lucerne fields until frost. The crop that should have been cut about 20th September was completely defoliated. The leafless stems were cut and left in the field. On 1st October, when the new growth was about 3 inches high, eggs again appeared on the leaves and stems. About 2 weeks later, eggs and all stages of the larvae were present and soon only the bare stems of the plants remained. After about 1st October, no eggs were found on soy beans. The larvae were present in practically every field of lucerne examined in the southern part of the State, but in some, injury was not extensive, as nearly all the eggs had been parasitised by *Trichogramma minutum*, Riley, and in some, the larvae were attacked by the fungus, *Spicaria prasina*. *A. gemmatalis* may be partly responsible for the defoliation of young seedlings of lucerne reported in the past to be done by a green caterpillar. In the autumn of 1936, unusually dry weather prevented the making of the normal early growth, so that no damage to the seedlings was possible. Delaying planting in the autumn will lessen the danger to them. Of 4 samples of calcium arsenate, all of which gave excellent control in field and cage tests, one containing 4·7 per cent. water-soluble As_2O_5 injured the plants slightly, the others, which contained 0·35, 0·65 and 0·68 per cent., did not injure the plants. Calcium arsenate cannot be used on lucerne that is soon to be cut for hay, but it can safely be used on seedlings in autumn.

Schlosberg (M.) & Mathes (R.). **Egg and Larval Populations of European Corn Borer in Relation to Time of planting and Yields of Sweet Corn.**—*J. econ. Ent.* **30** no. 2 pp. 280–287, 7 refs. Menasha, Wis., April 1937.

This is a report of investigations in northern Ohio during 1934, 1935 and 1936 to determine the practicability of planting sweet maize late, to reduce infestation by the European corn borer, *Pyrausta nubilalis*, Hb., all seasonal factors, including injury by other pests, being taken into account. Batches of sweet maize were planted each year at weekly intervals from the first week in May to the first week in July. In 1934, 1935 and 1936, 1, 3 and 5 strains were used, and each planting was repeated 3, 4 and 5 times, respectively. One of the strains was a late-maturing one. A single generation of *P. nubilalis* occurred in 1934 and 1935 and two in 1936. The peak of oviposition by the overwintered generation in the three years was on 3rd, 12th and 9th July, respectively, and that of oviposition by the first generation in 1936 on 13th August. Of the total number of eggs recorded in 1936, 69·67 per cent. were of the first generation. The earlier plantings received most of the first-generation eggs, as they were taller and in the early tassel stage. During oviposition by first-generation adults, all maize was about the same height, but that planted later was at a more attractive stage of tassel development, and therefore received nearly all the eggs. The first five lots of sweet maize to be planted contained all the eggs in 1934, 92·6 per cent. in 1935, and 97·2 per cent. of the first generation eggs and 68·9 per cent. of the total in 1936. Larval distribution corresponded to that of eggs. The first five lots contained 98·1 per cent. of the larvae in 1934, 86·9 per cent. in 1935, and 67·6 per cent. of the total number and 96·6 per cent. of the first generation in 1936. It appears, therefore, that, under single generation conditions, sweet maize planted in June or early July contains relatively few larvae as a result of its escaping heavy oviposition. It is significant that the population of first generation larvae in sweet maize planted late remained relatively low in 1936, when infestation was much higher than in 1934 or 1935.

In 1934, when infestation by *P. nubilalis* was light, but the corn ear worm, *Heliothis armigera*, Hb. (*obsoleta*, F.), was abundant and became increasingly so as the season advanced, production of uninjured saleable ears was significantly above the average for all batches on plots planted on 4th and 25th May and 1st June, and below it on those planted on or after 15th June. Most ears were only slightly injured and could be trimmed for canning. On the basis of whole untrimmed ears, the production of canning yield was significantly above the average in plots planted on 1st, 8th, 15th and 22nd June, and below it on those planted on 11th and 18th May. In 1935, when infestation by *H. armigera* was relatively light, the production of uninjured saleable ears was significantly above the average on plots planted on 19th and 26th June and 3rd July, and below it on those planted on 1st, 8th, 15th and 29th May. When the injured portions of the ears were trimmed, the weight of uninjured cut sweet maize obtained, as for canning, was in no case significantly different from the average. In 1936, when infestation by *H. armigera* was again light, the production of uninjured saleable ears was above the average on plots planted between 15th May and 12th June, and below it on the plots planted on 1st and 8th May and 3rd July. When the injured ears were trimmed, the yield was above the average on plots planted on 22nd and 29th May and 5th June, and below it on those planted on 1st and 8th May and 3rd July. Late planting is more profitable in the case of crops for canning than of those for market, as in the latter case the high prices obtainable early in the season must be taken into account.

CORY (E. N.) & KNIGHT (P.). **Observations on Brood X of the Periodical Cicada in Maryland.**—*J. econ. Ent.* **30** no. 2 pp. 287–294. Menasha, Wis., April 1937.

A summary is given of reports on investigations on the behaviour of the periodical cicada [*Magicicada septendecim*, L.] in Maryland, supplemented by accounts of various observations.

Excavations were begun in October 1935 and continued until the nymphs emerged. During October and November, soil burrows, 3–4 inches long, containing at least one rootlet of a tree or shrub, were found usually at a depth of 12–18 inches. In many, *Folsomia fimetaria*, L., was present. The cicada nymphs would crawl slowly when disturbed. In the course of March 1936, they tunnelled upwards;

many were within an inch of the surface by 4th April, and turret building was general. The first nymph emerged on 11th May and the peak of emergence was 10 days later. The insects remained in the completed burrow, which was often 12 inches long, for approximately 3 weeks before emerging. When turrets are formed, the chamber has to be open at the surface, but otherwise, it is only opened shortly before emergence. The general building of turrets (the construction of which is discussed) ended 2 weeks before the beginning of emergence, which was effected through the hole at or near the top. In 3 turrets, however, the holes were at the base. Most of the turrets were 35 50 mm. high. Extensive observations showed that neither moisture, light, heat nor the nature of the soil had a consistent effect on the building of turrets, though they were usually constructed late in the day and after dark. No feeding was observed during the month preceding emergence, and many burrows contained no roots to a depth of 6–8 inches. Several observers watched the emergence of the nymphs. The light of 2,500 watt lamps did not deter them. Almost all of them went as directly as vegetation would permit to a tree or shrub, but not necessarily to the nearest. Evidence was obtained that those that emerge from the ground near or after midnight frequently fail to complete their metamorphosis, and that emergence is accelerated by heat.

The cicada's song, transmitted to a loud speaker in an adjoining room, failed to orient significant numbers of virgin females.

In areas where the cicadas were abundant, eggs were laid on delphinium, hardy phlox and *Hemerocallis fulva*, as well as on some, but not all, species of *Azalea* and *Magnolia*, while in those where the cicadas occurred in small numbers, only such plants as oak and hickory bore conspicuous signs of oviposition. The population per acre in a heavily infested area, calculated from the minimum count of 32 nymphs per sq. ft., was 1,403,920. In the laboratory, adults were kept in cages and fed on branches of apple. The longest survival was 23 days. In only one instance were eggs in dry twigs observed to hatch. According to counts made in August, the average percentage hatch is 94·5. A freshly cut oak, 33 ft. high, and on which the first limb was 9 ft. from the ground, had 5,505 punctures. On the known average of 25·1 eggs per puncture, the total number of eggs in this tree would be over 138,000. Eggs kept at 32°F. for 24 hours and at 18°F. for a further 24 hours hatched after a return to normal outdoor temperatures. The eggs were crushed in 24 out of 191 egg pockets dissected in August. The main hatching began on 24th July and ended on 26th August. The nymphs were seen to drop to the ground from low-hanging branches, and adhesive bands round the main branches and trunks of 7 small trees yielded only 1 nymph. The young nymphs began burrowing vigorously as soon as they reached the soil. Nymphs were reared through the last few months in tunnels made in potatoes, sweet potatoes, apple, turnip, carrot and onion, the first two being the most satisfactory. The best results were obtained in a dark basement with a temperature of 55–58°F. None reached the adult stage, but one nymph did so when kept in a dampened mould of plaster of Paris.

Sprays of rotenone, alone and with Penetrol, gave only 25 per cent. kill of adult cicadas. A pyrethrum spray (Red Arrow, 1 : 400) killed all those that it hit [*cf.* *R.A.E.*, A **25** 470]. Spraying at night when the cicadas are least active is most successful.

BECKWITH (C. S.) & DOEHLERT (C. A.). **Control of *Rhagoletis pomonella* (Walsh) in cultivated Blueberry Fields.**—*J. econ. Ent.* **30** no. 2 pp. 294–297, 3 refs. Menasha, Wis., April 1937.

During the past few years, the crops of cultivated blueberry in New Jersey have increased, and it has been impossible to keep the trees free from ripe fruit and the ground from fallen ones. As a result, the crop has become infested by the blueberry form (*mendax*, Curran) of the apple maggot, *Rhagoletis pomonella*, Walsh, from which it was previously free, although wild blueberries were attacked throughout the State. As the fruit is eaten fresh in New Jersey and an arsenical dust [*R.A.E.*, A **18** 645] is therefore not suitable for control, tests were carried out with dusts of derris (5 per cent. rotenone) and pyrethrum (0·9 per cent. pyrethrins) on adults in cages, a description of which is given. Pyrethrum was slow in its action, and tests with it were discontinued. Derris at 30 mg. to the cage (capacity ⅓ cu. ft.) killed the flies in 3½ hours., and when only 5 mg. was used, they were incapacitated in 2 hours and did not recover. The latter dosage would equal 4⅓ lb. per acre for plants 3 ft. high or 8⅔ lb. for plants 6 ft. high. For large and small plants, 15 and 10 lb. per acre, respectively, were recommended. No diluent was used with the dust, which was distributed by monoplanes and autogyros. Emergence tests were made with 38 individuals. The greatest number emerged on 21st June, and dusting from 30th June to 2nd July and again 10 days later was recommended. Fields covering an area of 225 acres were treated according to these recommendations; no live adults were found in any of them 24 hours later. From U.S. pint samples of fruit taken in late July from each of 28 treated fields throughout the State, 2 larvae in all were recovered. In samples from 3 untreated fields, there were 30, 19 and 1, respectively.

CARRUTH (L. A.) & KERR jr. (T. W.). **Reaction of Corn Ear Worm Moth and other Insects to Light Traps.**—*J. econ. Ent.* **30** no. 2 pp. 297–305, 3 figs., 7 refs. Menasha, Wis., April 1937.

The data given in this paper were obtained during tests in 1936 on electrocuting light-traps for the control of *Heliothis armigera*, Hb. (*obsoleta*, F.) on maize in western Long Island, and are supported by preliminary work done in 1934 and 1935. Incidental observations on the reaction of *Pyrausta nubilalis*, Hb., and *Aserica* (*Autoserica*) *castanea*, Arrow, to the traps are included. Three kinds of light sources were used, 4 tungsten 75-watt lamps, and 4 mercury-vapour lamps with a wattage of 25, and 1 with a wattage of 60. In each case the lamp was surrounded by a series of alternating grids, charged, by means of a transformer, with electricity of a high voltage and a low amperage; a receptacle below caught the dead insects. The traps were hung at the height of the maize tassels. The tungsten lamps were operated from 8th August to 1st September, and the others from 20th June to 21st September. Records from the 25-watt lights show that the numbers of insects caught are appreciably influenced by night temperatures, especially when these fall below 60°F. [*cf. R.A.E.*, A **23** 645]. *A. castanea*, *P. nubilalis* and *H. armigera* were caught in greatest abundance in late July and August, late July and early August, and from mid-August till the end of the season, respectively. The traps were not in operation soon enough to catch adults of the overwintered brood of *P. nubilalis*, and the first brood of *H. armigera* was very light. Some adults of *Malacosoma americana*, F., were attracted in late June and early July, the greatest number being caught on 27th June. The mercury-vapour lamps attracted more of both sexes of *H. armigera* per trap-unit than the tungsten lamps, but more males than females were caught by all lights, though laboratory and field experiments in Texas in 1905 indicated that females are more numerous than males. The two sexes of *P. nubilalis* appeared to be attracted approximately equally to the various light sources, although the 25-watt lamps attracted a smaller total number of moths than the others. The 25-watt lamps were also less effective than the other types in attracting *A. castanea*, whereas the 60-watt mercury-vapour light caught rather more of both insects than did the 75-watt tungsten light. Infestation counts made just before picking indicate that the use of light-traps did not appreciably reduce the numbers of *H. armigera*, and certainly did not effect any practical control, probably on account of the great fecundity of the species.

MOORE (J. B.). **Reactions of Aphids to colored Insecticides.**—*J. econ. Ent.* **30** no. 2 pp. 305–309, 2 figs., 2 refs. Menasha, Wis., April 1937.

As it has been shown that the attraction of Aphids to potato leaves sprayed with Bordeaux mixture was due to the greater intensity of light reflected from sprayed leaves [*R.A.E.*, A **23** 467], tests were made in New York on winged and wingless females of *Myzus persicae*, Sulz., to determine whether their responses followed the inverse-square law of light intensities and so whether light intensity was the primary factor in attracting them to sprayed leaves. The apparatus used is described in detail. The unsprayed leaf was kept at a fixed distance from the source of light, and tests were carried out with the sprayed leaf at the same and increasingly greater distances. Each test was repeated 20 times, 30 individuals being used each time.

The Aphids appeared to follow the inverse-square law; larger numbers were attracted to the sprayed than the unsprayed leaf, but as the sprayed leaf was moved to increasingly greater distances from the light source, the difference decreased in inverse proportion to the distance, the attraction of the unsprayed leaf eventually becoming greater.

Brevicoryne brassicae, L., is more abundant on cabbage dusted with lead arsenate and lime than on untreated cabbage. As Aphids were less attracted to leaves sprayed with Bordeaux mixture containing green colouring matter than to those sprayed with Bordeaux mixture alone [*loc. cit.*], experiments were carried out with lead arsenate and lime coloured with green, which faded in 1 hour, and red, which faded in 24 hours, and with a black dust made by substituting 300-mesh charcoal for the lime. One control was treated with normal white lead arsenate and lime dust, and one was untreated. The applications were made weekly for 5 weeks beginning when the first Aphids were noticed, and counts were made 6 weeks after the first application. The number of colonies of Aphids per plant on cabbages dusted with white, green, red, and black dust and untreated ones was 653, 623, 507, 275 and 429, respectively, a difference of 66·861 being significant, and in the same order, the number of plants sufficiently infested to be unmarketable, one month after treatment had ceased, was 28, 28, 21, 14 and 20, a difference of 4·41 being significant.

WALKER (H. G.) & ANDERSON (L. D.). **Control of the Pavement Ant attacking Eggplants.**—*J. econ. Ent.* **30** no. 2 pp. 312–314, 1 ref. Menasha, Wis., April 1937.

In 1936, from 5 to more than 50 per cent. of the egg-plants [*Solanum melongena*] in nearly every field in south-eastern Virginia were attacked by *Tetramorium caespitum*, L. (pavement ant), which hollows the main root and eats away the side roots, so weakening the plants that they fail to produce a crop and sometimes die. Most of the damage is done during May. In 1935, the ants refused to feed on a poison bran bait [*R.A.E.*, A **4** 125]; and a bait of brown sugar and Paris green (16 : 1), a carbon bisulphide emulsion and a derris spray all failed to give satisfactory control. Various materials (applied in small depressions round the plants and covered with soil) were therefore tested in 1936. Of these, derris dust, a 3 per cent. nicotine dust and fish scrap were ineffective, mercury bichloride solution and a proprietary soil fumigant containing carbon bisulphide were ineffective and injured the plants, a calcium cyanide dust and a mixture of ethylene dichloride and carbon tetrachloride (3 : 1) killed the plants and a 1·5 per cent. tar acid oil emulsion with a phenol coefficient of 2+ gave good control of the ants but also injured the plants. Promising results were, however, obtained with a chlorinated naphthalene product (Halowax), and a thiocyanate (Loro), both used at a dilution of 1 : 200, and with naphthalene flakes. An experiment on the best method of applying naphthalene flakes, started on 27th May, showed that burying them in a small hole about 3 inches deep by the side of the plant gave better and more lasting protection than sprinkling them on the surface and covering them with soil or leaving them exposed, but applied in this way, they retarded the growth of the plants.

DRIGGERS (B. F.). **Experiments with Calcium Arsenate to control Codling Moth.**—*J. econ. Ent.* **30** no. 2 pp. 314–319, 3 refs. Menasha, Wis., April 1937.

A relatively safe calcium arsenate [*R.A.E.*, A **24** 256] was compared with lead arsenate for the control of the codling moth [*Cydia pomonella*, L.] on apple in New Jersey in 1936. In all cases, the first cover spray was applied 7 days after petal fall and subsequent ones at intervals of 10 days. All quantities are per 100 U.S. gals. spray. In the first experiment, carried out in the south-west, plot 1 received 4 lb. calcium arsenate, 2 lb. Coposil [copper ammonium silicate], 2 lb. lime and 4 oz. Ortho dry spreader, in the first spray. The second and third sprays were the same except that only 2 lb. calcium arsenate were used, and 3 U.S. qts. Orthol-K oil were added. The fourth was the same as the second without the Coposil and lime. The fifth and sixth consisted of 4 lb. calcium arsenate, 8 lb. lime and 8 oz. Ortho. The seventh was like the fourth except that 8 oz. Ortho were used. The eighth consisted of 3 lb. calcium arsenate, 6 lb. lime and 8 oz. Ortho. The first four were for the control of the first brood and the last four for the second brood. Plot 2 received only four cover sprays, which were identical with the first four sprays applied to plot 1, except that lead arsenate was substituted for calcium arsenate. Plot 3 received the same treatment as plot 2 and in addition a fifth spray consisting of 4 lb. lead arsenate, 8 lb. lime and 8 oz. Ortho, and two more consisting of 2 lb. lead arsenate, 8 oz. Ortho and 3 U.S. qts. Orthol-K. For plots 1, 2 and 3, respectively, the percentages of uninjured apples were 11·6, 14·8 and 20·9, the percentages of " stung " apples 30, 25·7 and 44·2, and the percentages of infested apples 58·4, 59·5 and 34·9. For plots 1 and 3, the averages of deposits of As_2O_3 in micrograms per square inch of leaf recorded at the end of 10 days of weathering following each of the first six cover sprays were 44·3 and 44·9 for the top of the tree and 77·2 and 72·1 for the bottom. This would indicate a greater loss due to weathering in the case of the calcium arsenate and oil because of the higher arsenic content of the calcium arsenate.

A second series of experiments was carried out in west-central New Jersey, to compare calcium arsenate, lime and milk with lead arsenate, lime and milk and with lead arsenate and oil. Half the plots treated with lead arsenate received no second brood sprays. Plots 1 and 3 were sprayed 5 times for the first brood and 3 times for the second with 3 lb. lead arsenate, 6 lb. lime and 4 oz. milk. Plot 2 received the same treatment with calcium arsenate substituted for lead arsenate. Plot 4 was sprayed as plots 1 and 3 for the first brood only. Plot 5 received 3 lb. lead arsenate, 6 lb. lime and 8 oz. Ortho in the first, second and fifth cover sprays and 2 lb. lead arsenate, 8 oz. Ortho and 3 U.S. qts. Orthol-K in the third and fourth. For the second brood, a sixth spray identical with the first, and a seventh and eighth identical with the third, were applied. Plot 6 was sprayed as plot 5, but for the first brood only. For plots 1, 2, 3, 4, 5 and 6, respectively, the percentages of uninjured apples were 80·2, 60·5, 81, 59·6, 83·4 and 72·8, the percentages of " stung " apples 16·8, 15, 15, 18·8, 14·5 and 16·1, and the percentages of infested apples 3, 24·5, 4, 21·6, 2·1 and 11·1. For plots 1 and 2, the averages of deposits of As_2O_3 calculated as in the previous experiment were 35 and 31 for the top of the tree and 50 and 51 for the bottom. It is suggested that the inferior results obtained with calcium arsenate may be due to the physical character of the deposit making it more difficult for a recently hatched larva to pick up a lethal dose of it than of lead arsenate, which forms an oily, dusty deposit that is readily disturbed or brushed off.

Langford (G. S.). **Biology and Control of the Juniper Webworm in Maryland.**—*J. econ. Ent.* **30** no. 2 pp. 320–323, 5 refs. Menasha, Wis., April 1937.

Dichomeris marginella, F. (juniper webworm), which first appeared as an injurious insect in Maryland in 1931, is now the most serious pest of *Juniperus communis* throughout the State. It attacks several varieties of this tree, though other species of juniper have escaped injury. Its bionomics and the injury it causes are described [*cf. R.A.E.*, A **10** 279 ; **22** 530]. There is only one generation a year in Maryland. The average number of eggs laid by 10 fertile females in captivity was 48, the maximum being 147. The egg stage lasts 10–14 days. Larvae were observed to hatch in the insectary as early as 27th May, and in the field from 22nd June, but are not easily found before July. The period of development after hibernation lasts 6–8 weeks, and pupation takes place from 25th April to 27th June. The pupal period lasted from 10 to 20 days, with an average of 16. The moths emerged from 19th May to 7th July, the peak being between 1st and 10th June. Adults given water lived in the laboratory for 20 days. Larvae were parasitised by the mite, *Pediculoides ventricosus*, Newp., and the Eulophid, *Horismenus microgaster*, Ashm. *Dibrachys cavus*, Wlk., *Pimpla* (*Ephialtes*) *aequalis*, Prov., *P.* (*Itoplectis*) *conquisitor*, Say, and *Habrocytus* sp. were bred from pupae and were responsible for a pupal mortality of 18 per cent. in an infestation in 1935. It was not determined whether *Horismenus microgaster*, *D. cavus* and *Habrocytus* sp. were primary or secondary parasites.

Spraying with 2 lb. lead arsenate in 50 U.S. gals. water at monthly intervals from 1st July to 1st October and 1st March to 1st May gave an average kill of 97·2 per cent. in a series of tests. For comparison, various materials were applied to trees in a heavily infested nursery block on 8th May 1936. On 14th October, infestation was nil on trees that had been sprayed with lead arsenate (2 lb. to 50 U.S. gals.), very slight on trees dusted with undiluted lead arsenate or calcium arsenate, medium to heavy on trees dusted with lead arsenate and sulphur (1 : 6), and heavy on trees sprayed or dusted with pyrethrum or rotenone. Soap was used with all pyrethrum sprays. Strong pyrethrum soap sprays prepared from material containing about 2 per cent. pyrethrins and carefully applied between 1st July and 1st October and 1st March and 1st May gave 97·3 per cent. kill at 1 : 200 and 96·4 per cent. kill at 1 : 400. Undiluted lead arsenate or calcium arsenate dust applied in summer or early autumn was effective. A 60 per cent. pyrethrum dust gave 79·6 per cent. kill in the spring and 94·4 per cent. kill in the summer. The best result obtained with rotenone was 73·3 per cent. kill effected by a 0·75 per cent. rotenone dust applied late in the summer.

HUCKETT (H. C.). **Further Tests with Pyrethrum as an Insecticide for Cabbage Worms.**—*J. econ. Ent.* **30** no. 2 pp. 323–328, 1 ref. Menasha, Wis., April 1937.

Experiments with pyrethrum for the control of Lepidopterous larvae attacking cabbage and cauliflower were carried out on Long Island in 1936 [*cf. R.A.E.*, A **24** 726]. Ground pyrethrum flowers of 0·9 and 0·6 per cent. pyrethrin content, an inert material impregnated with extractives of pyrethrum flowers and having a pyrethrin content of 2 per cent., and pyrethrum powder impregnated with extractives of pyrethrum flowers and having a pyrethrin content of 0·5 per cent., were compared, and clay, talc, gypsum and infusorial earth were tested as carriers. Infusorial earth was included as a "fluffing" agent in all mixtures of ground flowers and impregnated powders with the other diluents at the rate of 2 lb. and 5 lb. to 100 lb. finished dust, respectively. When the light infusorial earth was the only diluent, the quantity used was determined by volume, 1 lb. being used to replace 4 lb. of the heavier materials. In the laboratory, the tests were carried out on the early instars of *Ceramica* (*Mamestra*) *picta*, Harr. The percentage mortality effected by dusts with a pyrethrin strength of 0·6, 0·5 and 0·4 per cent. was 98·0, 96·9 and 71·6, respectively, in the case of dusts prepared from ground flowers of 0·6 per cent. pyrethrin content; and 92·4, 69·0 and 32·9 when the flowers contained 0·9 per cent. pyrethrin. Mortality in the controls was 3·6 and 4·9, respectively. Clay was the diluent used. In a second experiment, all the powders were tested with the various diluents. The pyrethrin strength of the mixtures was arbitrarily fixed at 0·5 per cent. when ground flowers were employed and 0·2 per cent. when impregnated powders were used. Clay invariably lessened the effectiveness of the dusts. With clay and infusorial earth, pyrethrum powder of 0·9 per cent. pyrethrin content gave 66·7 and 82·5 per cent. mortality, respectively, and powder with 0·6 per cent. pyrethrin gave 90·3 and 93·8 per cent. The impregnated inert dust gave 67·8, 89·0, 95·6 and 98·9 per cent. mortality when combined with clay, talc, gypsum and infusorial earth, respectively, and the impregnated powder gave 73·3, 90·3, 96·6 and 96·8 per cent.

Field tests were carried out in August and September in one lightly infested and one more seriously infested field of cauliflowers. Population counts on 20 control plants in October showed an average of 0·7 *Pieris rapae*, L., 8·8 *Plusia brassicae*, Riley, and 3·3 *Plutella maculipennis*, Curt., per plant in the first, and 0·5 *Pieris*, 8·8 *Plusia* and 15·6 *Plutella* in the second. Plots were arranged according to the Latin square system [**25** 428]. In the first field, dusts were applied on 25th August and 9th and 23rd September, and in the second, on 28th August and 11th and 26th September. The rate of application increased as the season advanced from 16½ to 25 lb. per acre in the first, and from 20 to 32 in the second, when clay, talc and gypsum were used, and from 4½ to 6 in the first, and 4½ to 8 in the second when infusorial earth was used. Plant injury was classified as none or a trace, slight, moderate, and severe, according to the amount of feeding injury on the inner foliage and the amount of frass accumulated at the bases of the inner leaves. The results of the laboratory experiments were confirmed. In the case of plants treated with pyrethrum powder of 0·9 per cent. pyrethrin content diluted with clay to 0·6, 0·5 and 0·4 per cent. pyrethrin content, the average percentage increases over controls in plants showing no injury or only a trace were 36, 31·5 and 20 ; and in the case of plants treated with powder of 0·6 per cent. pyrethrin content, the increases were 52·5, 48 and 42·5. In the second field experiment, the combinations tested were the same as in the second laboratory experiment. The increases over the control in the percentage of plants showing no injury or only a trace in one field in the case of plants treated with ground pyrethrum flowers (0·9 per cent. pyrethrin content) and the averages for two fields in the case of those treated with the impregnated inert dust and impregnated powder, in combination with clay, talc, gypsum and infusorial earth were, respectively : 25, 37, 44 and 43 ; 13·5, 29, 33 and 25·5 ; and 19·5, 33, 39 and 38.

PEPPER (B. B.). **Control of Wireworms and Onion Thrips by Carbon Bisulfide carrying Naphthalene or PDB.**—*J. econ. Ent.* **30** no. 2 pp. 332–336, 7 refs. Menasha, Wis., April 1937.

In northern New Jersey, Elaterid larvae of various genera are among the most important pests of cabbage, cauliflower, horse-radish [*Cochlearia armoracea*], beet and other vegetables. As the chief damage is done to the early crops and these are planted before infestation begins, most of the previously recommended methods of control [*R.A.E.*, A **15** 301 ; **20** 82] are unsuitable. R. C. Burdette having ascertained that paradichlorobenzene caused injury to plants in certain types of soil, but protected them from injury by wireworms in others, solutions of paradichlorobenzene and naphthalene in carbon bisulphide and in cottonseed oil were tested as emulsions for their control in 1935 and 1936. It was found that 10 lb. naphthalene or paradichlorobenzene could be dissolved in 1 U.S. gal. carbon bisulphide and only 2 lb. in 1 U.S. gal. crude cottonseed oil. The experiments were carried out in the field on cabbage and cauliflower. The paradichlorobenzene and cottonseed oil was emulsified in a manner already noticed [**20** 632], and the carbon bisulphide carrying either of the crystalline materials was emulsified with sulphonated castor oil or Aresklene (sodium salt of a sulphonated diphenyl compound). To each plant 1 U.S. pt. of liquid was applied. Counts were made 72 hours after treatment. All quantities given are per U.S. pint of liquid. Over 80 per cent. of the wireworms were dead after treatment with $\frac{1}{8}$ oz. carbon bisulphide carrying 1 gm. naphthalene or paradichlorobenzene and prepared with either of the emulsifiers, 40·5 per cent. after treatment with $\frac{3}{4}$ gm. paradichlorobenzene in $\frac{1}{8}$ oz. carbon bisulphide emulsified with sulphonated castor oil, and 55·3 per cent. after treatment with 1 gm. paradichlorobenzene in cottonseed oil. Carbon bisulphide alone or with the addition of a pyrethrum extract gave only low percentages of mortality, and the effect of the pyrethrum was reduced by the addition of soap. There was no mortality among controls. All these materials were ineffective at lower concentrations. Carbon bisulphide and naphthalene was the cheapest combination.

During the summer of 1936, preliminary experiments were carried out with emulsions of carbon bisulphide and paradichlorobenzene or naphthalene for the control of *Thrips tabaci*, Lind., on onion. The naphthalene and carbon bisulphide were used at the rate of 2 lb. to 3 U.S. pts., emulsified with sulphonated castor oil and diluted to make 100 U.S. gals. spray, to which enough potassium oleate was added to give an actual soap concentration of 0·25 per cent. The sprays were compared with nicotine sulphate (1 : 600) plus 0·25 per cent. actual soap. Sprays were applied on 2nd, 8th and 15th July, and counts were made 24 hours after the second and third treatments. The numbers of thrips on 5 plants treated with carbon bisulphide and naphthalene, carbon bisulphide and paradichlorobenzene, and nicotine sulphate, and on 5 untreated plants were 18, 22, 51, and 913 on 9th July, and 14, 18, 81, and 1,899 on 16th July. Unlike the nicotine sulphate, the other sprays killed the thrips in the crevices of the leaves. No sign of foliage injury was noticed. The price of the carbon bisulphide and naphthalene emulsion is about $\frac{1}{3}$ that of nicotine and soap.

Headlee (T. J.). **Experiences with the Termite in New Jersey.**—*J. econ. Ent.* **30** no. 2 pp. 337–341. Menasha, Wis., April 1937.

Only 10 inquiries about termites were made in New Jersey between 1888 and 1925. From 1925 to 1931 there were 18 inquiries, and in the five years from 1931–32 to 1935–36 there were 22, 88, 72, 218 and 142, respectively. As trouble from termites in buildings occurs principally in suburban districts where houses have been built on what was formerly woodland, a study of termite infestation under woodland conditions was made. Only one species, *Reticulitermes flavipes*, Kollar, was present. No termites were found in an area from which the timber had been recently cut and removed, though stumps and branches were lying about in abundance, nor from one in which grass had been allowed to develop for a number of years, but 16 colonies were found in a second-growth area covered mainly with oak, hickory, walnut and undergrowth. This was attributed to the fact that the third area was the most moist. All colonies were in fallen timber, none in stumps whether in the soil or uprooted, and none in living wood. In no case was the inside of a log completely destroyed. Infestation of houses was found to be due chiefly to the construction of sun-porches and garages directly on the soil, or only a few inches above it, and the insertion of posts into the ground. The importance of using metal shields [*R.A.E.*, A **17** 730] or of making a substructure of good, rich, poured concrete, extending at least 18 inches above ground level and entirely free from cracks, is stressed. For established infestations also the metal shield is recommended.

BRITTON (W. E.). **Concerning Official Common Names for Insects.**—*J. econ. Ent.* **30** no. 2 pp. 341–345, 18 refs. Menasha, Wis., April 1937.

The author criticises some of the popular names adopted in and submitted for lists of insect names approved by the American Association of Economic Entomologists [*R.A.E.*, A **20** 142, etc.] and suggests alternatives.

TIHENKO (V. J.) & HENSILL (G. S.). **Method for determining Amount of Mineral Oil deposited on Orange Leaves immediately after Spraying.**—*J. econ. Ent.* **30** no. 2 pp. 355–360, 1 fig., 4 refs. Menasha, Wis., April 1937.

Various methods of determining the deposit of oil emulsions on foliage are reviewed from the literature, and details are given of a newly devised rapid technique and of tests demonstrating its validity. The principle on which it is based is that the oil and water are washed off the leaves as soon after spraying as the run-off has finished, using acetone, which is a solvent for both, and the acetone and water are evaporated off together. The residue is dissolved in petroleum ether and the solution evaporated. The oil is then heated with sulphuric acid and centrifuged, and the amount is determined from the reading in the neck of a sulphonation bottle.

CARTER (W.). **Importation and Laboratory Breeding of two Chalcid Parasites of** *Pseudococcus brevipes* **(Ckll.).**—*J. econ. Ent.* **30** no. 2 pp. 370–372, 1 fig., 2 refs. Menasha, Wis., April 1937.

The Encyrtids, *Hambletonia pseudococcina*, Compère, and *Anagyrus coccidivorus*, Doz., were imported into Hawaii during 1935 and 1936 for the control of *Pseudococcus brevipes*, Ckll. (pineapple mealybug). A bisexual strain of *H. pseudococcina* from Brazil failed to reproduce on a large caged pineapple plant on which large numbers of mealybugs had been placed, or on the thick ends of pineapple leaves heavily infested and kept in a glass jar, but a parthenogenetic strain from Colombia and Venezuela bred freely under the latter conditions, producing only females. *A. coccidivorus* from Brazil reproduced with little increase on the plants, but bred more freely on the leaves. Both it and the parthenogenetic strain of *Hambletonia* reproduced satisfactorily on infested young pineapple fruits left on the plants and enclosed in a celluloid cage into which the parasites were introduced through a side sleeve. Only one generation of parasites can be bred on one fruit, as after a month the mealybug colony becomes weakened owing to lack of attendance by ants. *Anagyrus* emerges after about 20 days and *Hambletonia* after about 30. The former produced approximately equal numbers of males and females, but among 707 individuals of the latter, there were only 2 males. Regular releases are being made.

REINHARD (H. J.). *Thylodrias contractus* **Mots. in Texas.**—*J. econ. Ent.* **30** no. 2 p. 372. Menasha, Wis., April 1937.

Larvae of *Thylodrias contractus*, Motsch., caused considerable injury to the stock of silk clothing in a shop in San Antonio, Texas, in December 1936. The occurrence of this Dermestid in houses has not previously been considered of economic importance.

DONER (M. H.). **Extended insecticidal Uses of Coal Tar Distillates.**—*J. econ. Ent.* **30** no. 2 p. 374. Menasha, Wis., April 1937.

Experiments carried out in orchards throughout the United States since 1933 indicate that coal-tar distillate emulsions may satisfactorily be used as cover sprays for the control of Aphids, with the addition of dehydrated lime to prevent scorching of foliage if strong concentrations are preferred ; and that they are of value as a spreader and adhesive for Bordeaux mixture, lime-sulphur or lead arsenate. Occasional difficulty has been experienced in obtaining stable mixtures of tar distillate and lead arsenate, but this can be overcome by adding casein or dry skim milk to the lead arsenate (in amount equal to the latter) before mixing with the clear water in the spray tank.

HOERNER (J. L.). **Dry Pyrocide and Gypsum for Control of the Squash Bug,** *Anasa tristis* **DeG.**—*J. econ. Ent.* **30** no. 2 p. 375. Menasha, Wis., April 1937.

Of various sprays and dusts tested under laboratory conditions in Colorado for the control of *Anasa tristis*, DeG., Dry Pyrocide, a concentrated stabilised pyrethrum dust, with gypsum (1 : 5), was the most effective, giving 100 per cent. kill of all the bugs hit. Field tests with a bellows duster gave the same result. No scorching was noticeable on 15 varieties of squash, but slight scorching occurred in hot weather on one variety when sulphur was substituted for gypsum. The adult bugs were entering the fields from 13th June to the end of July. To protect the fields during this period, 12–18 applications are necessary. For seedling squash and plants that cover the ground, 5 and 20 lb. dust per acre, respectively, are required. The dust also killed 100 per cent. of the striped cucumber beetle [*Diabrotica melanocephala*, F.], the melon Aphid [*Aphis gossypii*, Glov.], the Colorado potato beetle [*Leptinotarsa decemlineata*, Say] the bean beetle [? *Epilachna varivestis*, Muls.] and the false chinch bug [*Nysius ericae*, Schill.], all of which occurred on squash in 1936.

BECKER (W. B.). **Some Notes on the Tunneling Habits of** *Hylurgopinus rufipes* **Eich.**—*J. econ. Ent.* **30** no. 2 p. 375. Menasha, Wis., April 1937.

Soon after a heavy emergence of *Hylastes* (*Hylurgopinus*) *rufipes*, Eichh., from logs of American elm (*Ulmus americana*) in Massachusetts, adults were seen making short bark tunnels, of the type of those in which they overwinter, into the trunks of apparently healthy American elm trees. Observations showed the presence of these short tunnels in trunks and branches even in the upper parts of trees. Unlike *Scolytus multistriatus*, Marsh., which is reported to attack elm twigs and buds, *H. rufipes* attacked small twigs only when confined on them. At the same time as the tunnels were noticed, adults of this Scolytid were observed to be constructing egg-galleries in neighbouring trap logs. A second generation was started, which is over-wintering in the larval stage.

Dicke (F. F.). **First Record of** *Bathyplectes tristis* **(Grav.), a Parasite of the Clover Leaf Weevil in the United States.**—*J. econ. Ent.* **30** no. 2 pp. 375–376, 1 ref. Menasha, Wis., April 1937.

The presence of *Bathyplectes tristis*, Grav., in the United States was first discovered in March 1935, when one minute larva was found in each of 2 larvae of *Hypera punctata*, F., collected at Arlington (north-eastern Virginia). On 15th April, one larva emerged from each of two full-grown host larvae among 125 collected 5 days before. In the field, the parasite was first observed on 20th May in the cocoon stage harbouring in that of *H. punctata*. During the next 7 days, 95 host cocoons were collected, 17 of which contained cocoons of the Ichneumonid. Parasitised cocoons were only half the normal size. The parasites remained as larvae throughout the summer, both in the laboratory and in the field. A prepupa was found in a cocoon on 28th September, and 2 pupae on 3rd October, from one of which an adult emerged on 7th October. In 200 sweeps of the net in lucerne on 9th October, and 25 in red clover on 19th, 15 and 4 adults were taken, respectively. Of 60 larvae of *H. punctata* collected on 9th December, 2 contained small parasite larvae in the thorax, where they had been feeding on the large visceral fat-body surrounding the fore-intestine. They were undoubtedly *B. tristis*. There is evidence that the heavy mortality of host larvae caused by the fungus, *Entomophthora sphaerosperma*, in the Arlington district seriously limits the numbers of the parasite.

Dicke (F. F.). *Eumicrosoma benefica* **Gahan as an Egg Parasite of the Hairy Chinch Bug.**—*J. econ. Ent.* **30** no. 2 p. 376, 2 refs. Menasha, Wis., April 1937.

An infestation of *Blissus hirtus*, Montd., was observed in north-eastern Virginia in August 1934 on experimental plots of velvet and creeping bent grass. During the following spring, it increased greatly and caused severe damage to the grass, particularly to plots that were infrequently watered and cut. In July 1935, adults of the egg parasite *Eumicrosoma benefica*, Gah., were noted in considerable numbers, and 52 per cent. of a collection of 71 eggs of *B. hirtus* made later in the month were parasitised. This Scelionid has previously only been recorded as a parasite of *B. leucopterus*, Say [*R.A.E.*, A **2** 383; **3** 452], and its introduction into Illinois in 1914 appears to be the only record of its establishment east of the Mississippi. It is thought that it was introduced into Virginia with the host in shipments of grass samples from infested areas.

JONES (S. C.). **Effect of certain cold-storage Treatments on Larvae of Cherry Fruitfly.**—*J. econ. Ent.* **30** no. 2 pp. 376–377. Menasha, Wis., April 1937.

In preliminary studies in 1930 in Oregon, a treatment similar to that recommended for fruit infested with the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.], namely storing at 28°F. for 4 hours and then at 30°F. for 6 days 20 hours [*cf. R.A.E.*, A **17** 662], killed only 21·21 per cent. of larvae of the cherry fruit-fly [*Rhagoletis cingulata*, Lw.] when applied to stoned cherries without sugar. However, no larvae of *Rhagoletis* survived in cherries stored for a week with or without sugar at 14°F. or with sugar (1 lb. to 3 lb. cherries) at 20°F.

McDANIEL (E. I.). **Sulfated Higher Alcohol to control Scale Insects on Greenhouse Plants.**—*J. econ. Ent.* **30** no. 2 p. 377. Menasha, Wis., April 1937.

Several applications of sulphated higher alcohol (6 oz. powder in 10 U.S. gals. water) to greenhouse plants at intervals of 2–4 weeks have been effective in controlling both shield and soft scales and have caused no injury to the plants. Old scales may be removed by washing the plants with water under pressure within 24 hours of each application.

DAVIS (A. C.). **Observations on the Life History of** *Paratrioza cockerelli* **(Sulc) in Southern California.**—*J. econ. Ent.* **30** no. 2 pp. 377–378. Menasha, Wis., April 1937.

Observations on the life-history of *Paratrioza cockerelli*, Šulc, were made in south-western California in April and May 1931. The Psyllids were kept in lantern-globe cages having tops of muslin or fine wire gauze, with a twig of pepper (*Capsicum*) or tomato in water. On pepper, eggs were laid along the edges of the leaves, but on tomato wherever the leaf was smooth enough to allow it. The incubation period for 91 eggs ranged from 7 to 11 days, and of 788 eggs, 92 failed to hatch. The percentage mortality during nymphal development was 70·5, and during the first instar 55·75. Only 3 nymphal instars were observed, but one moult may have been missed. The time required for the nymphal stage varied from 19 to 42 days, the average being 31·2 days. Of 545 adults reared, 339 were males. For 11 females, the number of eggs laid, the oviposition period and length of adult life in days averaged 406·6, 27·8 and 33·8. Pairing occasionally occurred 1 or 2 hours after the emergence of the female, but usually 24 hours or more elapsed between emergence and pairing. The first eggs were laid 2 to 8 days after emergence.

JANES (M. J.). *Paratrioza cockerelli* **(Sulc) on Tomatoes in southwest Texas.**—*J. econ. Ent.* **30** no. 2 p. 379. Menasha, Wis., April 1937.

An infestation of *Paratrioza cockerelli*, Šulc, was found for the first time in south-western Texas in autumn 1936, when it bred on tomatos during October and November, causing noticeable damage in several localities. It was widely distributed through four counties, eggs and nymphs being present in most places, sometimes in abundance, and adults in every field of tomatos examined.

Bottimer (L. J.). **Some Notes on *Bruchus brachialis* Fåhraeus.**—*J. econ. Ent.* **30** no. 2 p. 379. Menasha, Wis., April 1937.

Records are given of the distribution of *Bruchus brachialis*, Fhs., in the United States in and north of Virginia [*cf. R.A.E.*, A **21** 414; **23** 277]. In one area of south-western New Jersey, less than 1 per cent. of the seeds of several self-sown plants of bird vetch (*Vicia cracca*) produced adult Bruchids, but the woolly-pod vetch (*V. dasycarpa*) was rather heavily infested, 56 per cent. of one batch of seeds producing Bruchids. Limited oviposition of *B. brachialis* in the field was obtained on pods of Hungarian common and purple vetches (*V. pannonica, V. sativa* and *V. atropurpurea*) and on a perennial sweet pea (*Lathyrus*). Not more than 6 eggs were found on the sweet pea plants; infested pods of vetches usually had 1–5 eggs each. These eggs hatched normally, but although some of the larvae entered the seeds, none matured. In four years in New Jersey, the overwintered adults first appeared on 29th April, and 9th, 10th and 18th May, respectively. The latest day on which the Bruchid was collected in the field was 10th October. Adults were taken on flowers of various plants, one was beaten from oak, and several were caught in May in a trap for the Japanese beetle [*Popillia japonica*, Newm.] with a geraniol-eugenol bait. Hibernating adults were not found. Live Bruchids were taken from unopened pods of hairy vetch in a rearing jar on 2nd July 1932, the material having been collected on 29th July 1931.

Knowlton (G. F.). **Strawberry Leaf Roller Parasites.**—*J. econ. Ent.* **30** no. 2 pp. 379–380. Menasha, Wis., April 1937.

During 1935, ten species of parasites were reared from two species of strawberry leaf-rollers in northern Utah, *viz.*, *Exochus pleuralis*, Cress., *Cremastus cooki*, Weed, *Elachertus cacoeciae*, How., *Catolaccus aeneoviridis*, Gir., *Spilochalcis delumbis*, Cress., *Microdontomerus anthonomi*, Crwfd., *Apanteles* (?) *aristoteliae*, Vier., *Microgaster comptanae*, Vier., *Chelonus phthorimaeae*, Gah., and *Goniozus platynotae*, Ashm., from *Ancylis comptana*, Froel. (*fragariae*, Walsh & Riley), and *Exochus pleuralis*, *S. delumbis*, and *G. platynotae* from *Anacampsis fragariella*, Busck. In 1936, 300 females and 200 males of *Macrocentrus ancylivorus*, Rohw., and 1,000 females and 500 males of *Cremastus cooki* were received from the east, and released in July in various infested districts.

Pepper (J. H.). **Breaking the Dormancy in the Sugar-beet Webworm, *L. sticticalis* L., by Means of Chemicals.**—*J. econ. Ent.* **30** no. 2 p. 380. Menasha, Wis., April 1937.

In Montana, 92–95 per cent. of the first generation larvae of *Loxostege sticticalis*, L., pupate during late June and early July; the adults emerge in 7–10 days and, under favourable conditions, produce a second brood. Occasionally, there is a partial third generation, but the cold prevents the larvae from developing. The remaining 5–8 per cent. of the first generation larvae enter a diapause, in which they remain until the following spring. In experiments, high temperature over a period of 6 months failed to break this diapause, but if the temperature was gradually lowered to below freezing point and the larvae were kept at this temperature for several days, they pupated. When the larvae were subjected for 6 hours at 27°C. [80·6°F.] to xylol, carbon tetrachloride, di-ethyl ether, ethylene dichloride, ethyl bromide and ethyl iodide at concentrations of 0·016, 0·078, 0·062, 0·057, 0·027 and 0·001 cc. per litre, respectively, and kept at this temperature after treatment, 100, 80, 70, 70, 60 and 44 per cent. pupated within 10 days. No pupation occurred after 10 days. There was no pupation among controls kept at the same temperature, even when it was maintained for 6 months. Parasites emerged within the same 10-day period from larvae that had been parasitised before the diapause, but in every case they were immature and unable to pupate.

Observations on the fat-bodies showed that they are well developed in the larvae, and that just before pupation, they are digested and appear as a yellow oily liquid. If the larvae enter the diapause, the fat-bodies apparently remain unchanged, and only liquefy when the diapause is broken either by low temperature or chemical treatment. In all cases they reappear, well developed, in the adult. It is therefore possible that the activating of the fat-digesting enzymes may be a strong factor in preventing or breaking down the diapause.

DOWDEN (P. B.). **Parasites of Larch Sawfly in western Montana and Great Lakes Region.**—*J. econ. Ent.* **30** no. 2 p. 381. Menasha, Wis., April 1937.

During the summer of 1935, an outbreak of *Pristiphora* (*Nematus*) *erichsoni*, Htg. (larch sawfly) [*cf. R.A.E.*, A **24** 246] occurred in the Flathead valley to the north of the boundary between Canada and western Montana. Later, a rather severe infestation was found in Montana along the north fork of the river. The sawfly was known to be present in the Great Lakes of the United States, where it was sometimes heavily parasitised, particularly by the introduced Ichneumonid, *Mesoleius tenthredinis*, Morl., and the native Tachinid, *Ptychomyia* (*Bessa*) *selecta*, Mg. To study parasitisation, 4,000 cocoons from Montana and several hundred from the Great Lakes Region (Michigan, Wisconsin and Minnesota) were reared in the laboratory. *Mesoleius*, *Ptychomyia* and an undescribed Pteromalid of the genus *Dibrachys* were reared from cocoons from both areas. Four individuals representing three species, *Stylocryptus* sp., *Phygadeuon* sp. and an undescribed species of *Aenoplex* emerged from the material collected in Montana and four individuals of *Pezoporus indistinctus*, Prov., and a few of *Dibrachys* sp. in the collection from the Great Lakes region. *M. tenthredinis* was important in certain areas of the Great Lakes region, and present in considerable numbers in western Montana, *Ptychomyia selecta* was of less importance in both regions, and the *Dibrachys* was important in Montana, but not in the Great Lakes region.

LINDGREN (D. L.). **Correction—Methyl Bromide Fumigation of Codling Moth Larvae.**—*J. econ. Ent.* **30** no. 2 p. 381. Menasha, Wis., April 1937.

The commercial fumigant tested against larvae of the codling moth [*Cydia pomonella*, L.] in walnut sacks in California [*R.A.E.*, A **25** 247] contained 3·4 per cent. methyl bromide and 96·6 per cent. carbon dioxide by volume when expanded as a gas, or 7 per cent. methyl bromide by weight.

Dow (R.). **Is Brood xi extinct ?**—*Bull. New Engl. Mus. nat. Hist.* no. 83 pp. 10–11. Boston, Mass., April 1937.

In certain parts of the United States, the periodical cicada [*Magicicada septendecim*, L.] appears in large numbers every 17 years. It causes a certain amount of damage in woodlands, but does not thrive in cultivated land. In the New England States, there are positive records of 4 different broods (ii, viii, xi and xiv). That is, there are not more than 4 years out of every 17 when the cicadas can be seen above ground. Brood xiv appeared in abundance in Massachusetts in 1923, and broods ii and viii in Connecticut in 1928 and 1934, respectively. These broods will probably appear again in their respective years, 1940, 1945 and 1951, but brood xi, which has not been reported since 1903, is probably extinct. It had been diminishing in numbers for many years and was not found in 1920, when it was last due to appear. If still in existence, it should appear in June 1937.

Twelth National Shade Tree Conference. Proceedings.—xii+213 pp., 1 fig. Boston, Mass, 1936. [Recd. 1937.]

This series of papers includes five on insect pests and their control. In Forest Insects in New England (pp. 4–7), H. B. Peirson points out that insect outbreaks in forests are largely due to the alteration of natural conditions by man, either by replacing mixed growth by pure types and so increasing the availability of suitable food-plants; or by indiscriminate thinning of old stands, which produces conditions favourable to some insects, such as sunlight for the sugar maple borer [*Glycobius speciosus*, Say] and the bronze birch borer [*Agrilus anxius*, Gory], and drying out and windfall for the spruce bark beetle [*Polygraphus rufipennis*, Kby.]. Mixed stands should therefore be encouraged by selective cutting and interplanting, as well as by initial planting. Generally, introduced insects appear to spread to the north-east, but higher wind-currents may carry them in a south-westerly direction. The balsam woolly aphis [*Chermes piceae*, Ratz.], the beech scale [*Cryptococcus fagi*, Bär.], the birch leaf-mining sawfly [*Phyllotoma nemorata*, Fall.] and the European spruce sawfly [*Diprion polytomus*, Htg.] have all spread south-west. Outbreaks of indigenous species can to some extent be predicted from the weather, and they may often be checked by appropriate cutting operations, and, it is suggested, by introducing against a given pest parasites collected in another region where an outbreak of the insect is just ending.

In the European Spruce Sawfly (pp. 145–150), H. J. MacAloney gives a brief review of the infestation of spruce by *Diprion polytomus*, Htg., in Canada [*R.A.E.*, A **20** 590; **23** 236; **24** 315; **25** 511] and discusses its distribution [**25** 410] and life-history [**24** 658] and the damage it causes in the United States. White spruce (*Picea glauca*) is the favoured food in Canada and northern Maine, black spruce (*P. mariana*) and red spruce (*P. rubra*) are attacked wherever they occur, and Norway spruce (*P. excelsa*) and Colorado blue spruce (*P. pungens*) are also food-plants. Brief descriptions are given of the larvae, cocoons and adults. In southern Connecticut, two generations occurred up to 10th August, so that there would be time for four during the year [*cf.* **24** 658]. The percentage of emergence from the cocoons of the first generation was high, and the tendency to rest for 2–6 years [*cf.* **22** 496] may possibly be confined to the generation that hibernates. In northern New Hampshire and Vermont, the larvae of the first generation had matured by late July; the first three larval instars were not found, and the larger larvae were scarce. Early in August large larvae were found at an elevation of 3,300 ft. in Vermont and 4,000 ft. in New York. Numbers of parasites, received from Canada, have been liberated at several points in Maine, Vermont, Massachusetts, Connecticut and New York. A Hymenopterous parasite of the western hemlock sawfly, *Diprion* (*Neodiprion*) *tsugae*, Midd., attacks *D. polytomus* readily in the laboratory, but no recoveries have yet been made of the colonies that were released in New York. Laboratory studies indicate that lead arsenate with an adhesive would give good control throughout the season, and calcium arsenate [*cf.* **22** 496], derris and lime-sulphur are promising. The larvae appeared resistant to phenothiazine [thiodiphenylamine], pyrethrum, nicotine sulphate, and nicotine tannate. A closely related sawfly, *Pachynematus piceae*, Rohw., which is also common in northern New England and New York, feeds exclusively on the new, tender needles, whereas *D. polytomus* shows a preference for older ones.

C. C. Hamilton, in The Identification of Insect Injury (pp. 150–160), outlines methods by which pests may sometimes be identified by the type and date of injury and by conspicuous structural characters without special knowledge of systematic entomology, and gives a specimen key for insects occurring on elm.

Control of insect pests by dusting rather than by spraying is recommended by G. K. Van Gundia in Possibilities of Dusting Shade Trees for Pest Control (pp. 161–167), on the grounds of the suitability of rotenone and other non-arsenical dusts for use near buildings, etc., better coverage, and speed and ease of application.

In Distribution of Arsenicals from the Air (pp. 168–181), E. H. Francis states that about 90 per cent. control of an infestation of spring cankerworm (*Palaeacrita vernata*, Peck) and fall cankerworm (*Alsophila pometaria*, Harr.), on woodland trees, was given by applying about 22 lb. lead arsenate per acre in an atomised spray from an autogyro. The best spray contained 200 lb. lead arsenate, 10 U.S. gals. fish oil and 1½ U.S. gals paraffin oil to 70 U.S. gals. water, the second oil being necessary to prevent the particles becoming too dry in the air. About 33·7 acres were sprayed per hour. Spraying from the ground with a power-sprayer gave 80 per cent. control and cost about twice the amount, requiring about 10 times as much labour and 14 times as much working time. Observations of birds in the sprayed territory failed to show any detrimental effect due to the lead arsenate. The technique of spraying from autogyros is discussed.

Insect Pests.—*Bull. Wisconsin agric. Exp. Sta.* no. 438 (Ann. Rep. 1935–36), pp. 121–128, 2 figs. Madison, Wis., March 1937.

Poison baits have sometimes failed to control cutworms in Wisconsin, probably because they are not effective against all the 14 species that have been found to occur there. Of those recently collected, 25 per cent. were larvae of *Lycophotia* (*Euxoa*) *scandens*, Riley, a species that appears to spend the later larval instars underground. In a test in June by H. F. Wilson and C. D. Harrington, 25 larvae of this species were confined on bare soil and poison bran bait was spread on the surface at a rate equivalent to 15 lb. per acre. After 24 hours, only 4 larvae had died and these were much smaller than the others, which had made a network of tunnels without coming to the surface. This suggests that the bait would be more effective if applied earlier in the season.

Drought in 1936 killed many of the wild plants on which the false chinch bug [*Nysius ericae*, Schill.] usually feeds, and it became very abundant in lucerne fields where it caused considerable damage. Experiments by E. M. Searls suggest that a dust of 1 part pyrethrum flowers to 9 parts finely ground sulphur will control it effectively. The tarnished plant bug [*Lygus pratensis*, L.] was also unusually abundant on lucerne during the early summer.

Injury to cucurbits by the striped cucumber beetle [*Diabrotica melanocephala*, F.] occurred in the second half of May. Of insecticides tested in the laboratory by T. C. Allen, 1 part derris (4·8 per cent. rotenone) to 9 parts talc, 1 part barium fluosilicate to 4 parts gypsum, and 2 parts calcium arsenate to 23 parts gypsum gave mortality rates of 99, 70 and 40 per cent., respectively; these results were generally confirmed by field tests. Investigations, also by Allen, are in progress on the relation between the pH content of carriers for derris and the effectiveness of the dust against Lepidopterous larvae on cabbage. The results indicate that derris is more toxic when used with relatively acid carriers than with highly alkaline ones.

In further trials on the control of the pea aphis [*Macrosiphum onobrychis*, Boy.] on canning peas [*cf. R.A.E.*, A **24** 717; **25** 245], J. E. Dudley, jr., T. E. Bronson and F. E. Carroll found that derris sprays continued to give satisfactory results. After mid-June, heat and drought soon controlled the Aphids and, owing to mechanical injury, applications made after 20th June in many cases resulted in lower yields than those secured without treatment. Dusts of derris and cubé [*Lonchocarpus*] with talc as carrier reduced infestation on an average by 73·5 and 64 per cent., when the rotenone contents of the dusts were 1 and 0·6 per cent., respectively. Experiments showed that derris and cubé sprays used with diphenyl butyl sodium sulphonate as spreader should contain not less than 0·005 per cent. rotenone to be effective. This spreader was less satisfactory than 7 others tested, but these are not named. It is thought that this Aphid can be effectively controlled by one application of derris made early in the season.

C. L. Fluke obtained almost complete control of both adults and larvae of the three-lined lema [*Lema trilineata*, Ol.] infesting potatoes and Japanese lanterns [? *Physalis francheti*] with a spray of 1½ lb. derris in 50 U.S. gals. water with an oleated resinous soap as spreader.

Further experiments are being carried out by J. H. Lilly to determine whether a single dormant spray can be found that will effectively control the fruit-tree leaf-roller [*Tortrix argyrospila*, Wlk.], the bud moth [*Eucosma ocellana*, Schiff.] and the cherry case-bearer [*Coleophora pruniella*, Clem.] on apple [*cf.* **24** 546, 601]. Infestation by *T. argyrospila* was reduced by 25 per cent. with a 4 per cent. Diamond Paraffin cold-mixed petroleum emulsion, and by over 50 per cent. when the basic emulsion was supplemented with dinitro-o-cyclohexylphenol (1 : 100), Loro (1 : 600), Selocide Concentrate (1 : 400), or Halowax, no. 1011 (1 : 200) [the last three being a thiocyanate, potassium-ammonium-seleno-sulphide, and a chlorinated naphthalene]. About 50 per cent. control was also obtained with 6 per cent. sprays of commercial petroleum miscible oils and oil emulsions, and a higher percentage with miscible oils in which the oil fraction is 95 per cent. or over. Lead arsenate sprays with adhesives gave promising results when applied at the "pink stage," just after most of the eggs have hatched.

Studies on the effect of dormant oil sprays on the growth of apple trees showed that 6 per cent. sprays of proprietary miscible oils or oil emulsions and various 4 per cent. cold-mixed formulae on reasonably healthy mature trees do not materially affect growth in an ordinary year. Sprays resulting in tree injury have almost invariably been quick-breaking tank-mixed emulsions containing at least 6 per cent. actual oil.

TRELEASE (S. F.) & TRELEASE (H. M.). **Immunity of certain Insects to Selenium Poisoning.**—*Science* **85** no. 2216 p. 590, 5 refs. New York, 18th June 1937.

An instance is recorded from Wyoming of *Bruchus* (*Acanthoscelides*) *fraterculus*, Horn., and the Eurytomid, *Bruchophagus mexicanus*, Ashm. (or a closely related species) completing their life-cycles in seeds of *Astragalus bisulcatus* that contained 1,475 parts per million of selenium [*cf. R.A.E.*, A **24** 769]. *Eutelus* (*Amblymerus*) *bruchophagi*, Gah., a parasite of the Eurytomid, was also present.

FREAR (D. E. H.) & WORTHLEY (H. N.). **The Application of Sprays to expanding Plant Surfaces.**—*Science* **85** no. 2217 p. 610. New York, 25th June 1937.

From work against *Cydia* (*Carpocapsa*) *pomonella*, L., on apple in central Pennsylvania in 1934, it was concluded that the early cover sprays of lead arsenate should be applied at shorter intervals than are usual in order to maintain an adequate deposit and compensate for the large increase of surface areas during the early period of the development of the fruit. Continued investigations in 1935, using a spray of 3 lb. lead arsenate, 5 lb. flotation (wettable) sulphur and 1 U.S. quart fish oil per 100 U.S. gals., showed that, to provide an adequate deposit on the fruit-surfaces in early June, the successive intervals between the first four sprays should be 5, 9, and 13 days. When further spraying is necessary, a fifth application 17 days after the fourth should maintain a deposit adequate for protection till early August.

CORY (E. N.) & GRAHAM (C.). **Pea Aphis Control in Maryland.**—*Trans. Peninsula hort. Soc. 1936* pp. 24–26. Dover, Del., 1937.

Of sprays tested against the pea aphis [*Macrosiphum onobrychis*, Boy.] on canning peas in Maryland prior to 1936, the best was nicotine sulphate and soap ; rotenone was practically ineffective, but was used without a spreader. In 1936, the average yield from two control plots was 325 lb. shelled peas per acre, and 14·5 Aphids per tip were present when the peas began to bloom. A spray of 1½ U.S. pints nicotine and 4 lb. potassium fish oil soap in 100 gals., applied to one plot on 18th June, about 10 days before flowering and when there were no Aphids present, to a second on the 18th and 30th June, and to a third on 30th June, increased the yield by 65·4, 104·9 and 57·5 per cent., respectively, and reduced the numbers of Aphids on the last two plots on 30th June from 13·4 to 6·5 and from 46 to 18 per tip, respectively, in 24 hours. A spray containing 0·009 per cent. rotenone, with ½ lb. sodium lauryl sulphate spreader per 100 U.S. gals., applied at the beginning of flowering, increased the yield by 128·3 per cent. and reduced the numbers of Aphids from 15 to 2 per tip. Another, containing 0·06 per cent. active derris extractive material, including rotenone, with the same spreader, applied to one plot 10 days before blossoming, to a second as flowering began and to a third at both these times, increased the yield by 247·0, 151·3 and 404·0 per cent., respectively, and on the second plot the number of Aphids was reduced from 14 to 7 per tip. At harvest, only a few Aphids were found on the plots treated with rotenone and the pods were green and tender, while on the control plots and on those treated with nicotine the Aphids were very numerous, the plants were almost all dead and the pods poorly developed. Rotenone, applied with a spreader, therefore appears to retain its efficiency for much longer than nicotine and soap [*cf.* *R.A.E.*, A **24** 717 ; **25** 245].

LANGFORD (G. S.) & ANDERSON (E. J.). **Insects and Diseases commonly encountered on Strawberries.**—*Trans. Peninsula hort. Soc. 1936* pp. 40–46. Dover, Del., 1937.

Brief notes are given on the types of injury caused by the commoner pests of strawberries in Maryland and on measures for their control ; they include *Anthonomus signatus*, Say, *Cerosipha* (*Aphis*) *forbesi*, Weed, *Ancylis comptana*, Froel., *Tetranychus telarius*, L., *Haltica ignita*, Ill., and Lamellicorn larvae. Plants in old strawberry beds are sometimes damaged by *Colaspis brunnea*, F., *Graphops pubescens*, Melsh., and *Paria canella*, F., the larvae feeding on the roots and the adults on the leaves. Virus diseases rarely, if ever, occur.

PORTER (B. A.). **The Codling Moth—a Nation-wide Problem.**—*Trans. Peninsula hort. Soc. 1936* pp. 60–67. Dover, Del., 1937.

A general survey is given of recent work on the control of the codling moth [*Cydia pomonella*, L.] on apple in the United States with special reference to the use of new sprays containing lead arsenate [*R.A.E.*, A **25** 419] and substitutes for it. Recommendations emphasise the value of supplementing early sprays of lead arsenate by other methods (banding, orchard sanitation, etc.) so that residues exceeding the limit of tolerance will not be present on marketable fruit.

STEARNS (L. A.), GUY (H. G.) & SCHMITT (J. B.). **Control of Codling Moth in 1936.**—*Trans. Peninsula hort. Soc. 1936* pp. 73–77. Dover, Del., 1937.

This paper, which is one of a series [*cf.* *R.A.E.*, A **24** 476], deals with the control of codling moth [*Cydia pomonella*, L.] on apple in Delaware in 1936. In orchards in which the first spray against the second brood was omitted, there was a considerable increase in the infestation of late fruit. In a series of experiments, a petal fall and seven cover sprays were applied, the last three being directed against the second brood. There were two very efficient spray mixtures, the first containing [per 100 U.S. gals. water] 4 lb. lead arsenate, 5 lb. hydrated lime, 1 U.S. pint fish-oil and 10 lb. flotation sulphur, the oil being omitted in the second-brood sprays, and the second containing 3 lb. lead arsenate, 5 lb. hydrated lime, 2 U.S. quarts summer oil (Orthol K) and 2 lb. Coposil [copper ammonium silicate], the oil being retained throughout the season. Where these sprays were applied, 86·1–86·6 per cent. of all dropped and harvested fruit was free from injury by *C. pomonella*. A list is given of 5 proprietary adhesives in order of their efficiency; none was so effective as fish oil. Lead arsenate even at the rate of 3 lb. per 100 U.S. gals. was more efficient than any other insecticide, and calcium arsenate at the rate of 4 lb. was the best substitute for it. Only about 25 per cent. of the fruit from trees treated with various sprays containing phenothiazine [thiodiphenylamine] was injured by *C. pomonella*. This insecticide kills the larvae before they can feed, but those that are able to feed are also able to enter the fruit.

WEIMER (J. L.). **The Possibility of Insect Transmission of Alfalfa Dwarf.**—*Phytopathology* **27** no. 6 pp. 697–702, 1 ref. Lancaster, Pa, June 1937.

An account is given of experiments in California to determine whether insects are responsible for the transmission of dwarf disease of lucerne. Rows of healthy lucerne planted beside rows containing both diseased and healthy plants gradually showed dwarf disease, but at no place in 1½ years had the disease spread more than about 25 feet from the diseased plants. It was proved that the soil did not contain the causal agent, nor was the disease being introduced by wind, irrigation water or other similar means, and it must therefore, in all probability, have been carried by insects, which must have been weak fliers, or such as could transmit it only in a wingless stage. Caged plants growing in the field remained free from infection, while uncaged ones became diseased, again suggesting insect vectors. In experiments, however, no evidence was obtained that the disease was transmitted by any of the insects tested, which comprised *Macrosiphum onobrychis*, Boy. (*pisi*, Kalt.), *Aphis rumicis*, L., a thrips, probably *Frankliniella occidentalis*, Perg., *Draeculacephala minerva*, Ball, *Gypona angulata*, Spbg., *Aceratagallia californica*, Baker, *A. obscura*, Oman, a species of *Deltocephalus*, *Stictocephala festina*, Say, *Lygus hesperus*, Knight, *Diabrotica balteata*, Lec., and *D. soror*, Lec., or by *Porcellio laevis*, Latr.

MURPHY (D. M.) & PIERCE (W. H.). **Common Mosaic of the Garden Pea,** *Pisum sativum*.—*Phytopathology* **27** no. 6 pp. 710–721, 14 figs., 9 refs. Lancaster, Pa, June 1937.

Evidence is given to show that the virus of common pea mosaic (pea virus 3) can be transmitted to a number of perennial leguminous plants and that it is not transmitted through the seed. It was found that *Macrosiphum onobrychis*, Boy. (*Illinoia pisi*, Kalt.) transmitted the virus, and it is probable that Aphids carry it to peas in spring from the plants in which it overwinters [*cf. R.A.E.*, A **14** 164].

HALL (D. G.). **New Muscoid Flies (Diptera) in the United States National Museum.**—*Proc. U.S. Nat. Mus.* **84** no. 3011 pp. 201–216, 8 figs. Washington, D.C., 1937.

The new flies described include *Hylemyia abdena*, recorded as an economic pest of carnations in Oregon; *Zenillia nox*, parasitic on

Pristiphora (*Nematus*) *erichsoni*, Htg. (larch sawfly) in Japan; and *Phaonia pudoa*, the larvae of which have been found to be predacious on those of *Dendroctonus monticolae*, Hopk., in pines in Idaho, Washington and Montana.

VAN ZWALUWENBURG (R. H.). **Summary of Laboratory Studies of** *Anomala*, **1933–1935.**—*Hawaii. Plant. Rec.* **41** no. 1 pp. 25–32, 3 refs. Honolulu, 1937.

Damage to sugar-cane by *Anomala orientalis*, Waterh., on the Island of Oahu (Hawaii) is known to vary with the type of soil. Measurements of the physical properties of soils from areas of known infestation showed that, in soils having a negligible organic content, susceptibility to infestation could be crudely determined by dividing the ignition loss by the moisture equivalent, the quotient being termed the *Anomala* coefficient. The ignition loss is determined from a soil sample that has been oven-dried at 105°C. [221°F.] to get the constant weight, and is the figure obtained by dividing the loss in weight after ignition for 30 minutes at 900°C. by the original oven-dried weight. The moisture equivalent is the percentage of moisture remaining in a soil sample that has been saturated and then been subjected for 30 minutes to a centrifugal force equivalent to 1,000 times the force of gravity. Ignition loss is high in soils with a large proportion of iron and aluminium colloids, and a high content of these materials is a striking characteristic of soils susceptible to severe damage by *Anomala* in Hawaii. Commercial damage does not occur in soils with a coefficient of less than 0·45, but may be very serious in those with one of over 0·65. Low coefficients are associated with soils that dry rapidly into hard clods to an appreciable depth and readily lose free moisture, while high ones are associated with those that dry into light, fluffy masses free from clods or cracks, the relative humidity in the air in the subsoil remaining high.

Studies on the life-history of the beetle [*cf. R.A.E.*, A **24** 300, 301, 379] were carried out in the laboratory. At room temperature (about 78°F.) and relative humidities of 100, 99·5, 98·7, 97·9, 97·1 and 96·3 per cent., the percentages of eggs that hatched were 100, 95·0, 95·0, 30·0, 5·0, and 0·0, respectively, and the durations of the incubation period 14·8, 16·0, 17·4, 17·8 and 18 days. Eggs hatched in unfavourable soil kept sufficiently moist, and 38 per cent. of some that were kept submerged for 10 days after being laid also hatched. Exposure to a constant temperature of 100°F. for 144 hours killed all eggs, but 50 and 14·2 per cent. hatched after exposure to this temperature for 24 and 120 hours, respectively, before removal to room temperature. At an optimum soil humidity, mortality of the eggs was not increased by exposure to a temperature of 104°F. for 2 hours daily. At average temperatures of 75·2 and 80·6°F. the pupal period for males averaged 11·4 and 9·1 days and for females 11·1 and 8·7 days, respectively; this difference between the sexes is of statistical significance and is the reverse of the general condition in Coleoptera. When fed on flower blossoms or apple, adults of both sexes lived for an average of about 18 days. The duration of the pre-oviposition period, actual days of egg laying and total oviposition period and the number of eggs laid by a female averaged 7·1, 8·3 and 11·4 days and 32·1 eggs, respectively. Under simulated field conditions, 9 beetles were reared in soil with an *Anomala* coefficient of 0·44, but with optimum conditions of moisture, the time from egg to adult averaging 164·5 days. Of adults reared in the laboratory from grubs collected in the field, 309 were females and 211 males.

Laboratory experiments showed that white arsenic thoroughly mixed with soil at the rate of 250 parts per million by weight caused a very high mortality among newly hatched grubs, and it is thought that they could be effectively controlled by mixing this poison with the top foot of soil at the rate of 625–750 lb. per acre.

HALLOCK (H. C.). **Recent Developments in the Use of electric Light Traps to catch the Asiatic Garden Beetle.**—*J. N. Y. ent. Soc.* **44** no. 4 pp. 261–279, 4 figs., 5 refs. New York, December 1936.

An account is given of further experiments [*cf. R.A.E.*, A **20** 426], carried out in Long Island and New Jersey, on the use of light-traps for the control of *Aserica* (*Autoserica*) *castanea*, Arrow, which congregates in large numbers near bright lights on warm summer evenings [*cf.* **24** 529]. In laboratory tests on the reaction of the beetles to lights of different colours, those near the violet end of the spectrum were the most attractive and the screens used showed the following order of decreasing attraction: red purple ultra, violet, blue purple ultra, daylight, dark blue, red, orange, yellow and green. Light from a mercury-vapour lamp was $2\frac{1}{2}$ times as attractive as an artificial daylight screen, but only $\frac{3}{4}$ as attractive as a violet screen. In field tests, the lamps used and their efficiency, expressed as a percentage of that of the first, were; a G-5 mercury vapour lamp with glass transmitting the long-wave regions of ultra violet, 100; a 500-watt daylight lamp with bulb tinted faint blue and proportionally richer in the blue end of the spectrum than those of clear glass, 58; a similar 100-watt lamp, 17; a G-5 black mercury vapour lamp with a bulb of dark purple resistant glass designed to cut out most of the visible radiation while permitting the passage of the longer ultra-violet rays, 60; a lower powered G-1 mercury vapour lamp, similar to the G-5 lamp and having the same spectral quality of output, which is recommended only in the clear glass bulb and was not used in the tests on which the figures for relative efficiency are based; a neon-filled glow discharge lamp with a visible spectrum brightness considerably higher than that of the clear bulb type of G-5 lamp but no measurable ultra-violet radiation, 28; an argon-filled glow discharge lamp emitting a purplish visible light, 22; and a high intensity mercury lamp emitting a medium greenish-blue light, 30.

With a 500-watt daylight lamp in a 4-foot funnel trap [**20** 426] to which had been added a 4-winged celluloid baffle [*cf.* **17** 421], the catch for the whole season in 1932 was 96,333 beetles. In 2 similar traps operated 60 feet apart and painted white, with a metal baffle extending from 6 ins. above the funnel to 18 ins. within it and with a pan 4 feet in diameter beneath it, the average hourly catches with a G-5 and a 500-watt daylight bulb in 27 hours between 8th July and 5th August 1933 were 1,932 and 1,672 beetles, and the maxima were 3,400 and 3,100, respectively. Of these totals, 20 and 25 per cent., respectively, were taken from the pans outside the funnels. In another trap, a large 4-winged baffle of aluminium was attached to the top of a small washtub, a G-5 bulb being placed at the intersection of the wings. After 11 hours, the catch averaged 1,630 beetles hourly. A trap with a white baffle with wings 6 ins. wide and 14 ins. high and an 18-in. funnel to the bottom of which was attached a fruit-jar was used with a G-1 lamp and a G-5 black bulb, the hourly catch averaging 345 and 258 beetles, respectively.

In 1934 a new type of trap was used. A baffle with 4 wings each 6 ins. wide and 16 ins. high extended 2½ ins. down into a 12-in. funnel, to which a fitting for a container was attached, and a 100-watt daylight lamp was inserted in a cutout at the intersection of the wings. The baffle and the inside of the trap were white and the outside of the funnel green. The average catch in this trap was 930 beetles per hour, and on the most favourable evening 2,000 per hour were taken. In 1934 and 1935, a modification of this trap was extensively used and, with a G-5 lamp, proved to be the most efficient of those tested ; the funnel was 18 ins. in diameter and the wings of the baffle 9 ins. wide and 20 ins. high. In 13 hours of use with a G-5 bulb, the average catch was 1,490 beetles per hour, with a maximum of 2,780. During July and August 1935, 4–6 traps were used on 27 nights on a flood-lighted golf driving course to which large numbers of the beetles were attracted, and over 300,000 were caught. The average numbers of beetles caught per hour in this type of trap when used without a light and with G-5, 500-watt daylight, G-5 black and neon lamps were 175, 1,820, 1,120, 675, and 550, respectively. A comparison of the catches with the two G-5 lamps indicates that the visible part of the spectrum is more attractive to the beetles. To some extent, the greater the intensity of the light used, the greater was the number of beetles caught, but with the 500-watt daylight bulb, beetles were sometimes seen to veer to one side as they flew towards it, and when it was tested against the G-5 lamp, it was only 85 per cent. as effective in traps with large baffles and funnels, and only 61·5 per cent. in smaller traps with much narrower baffles. When a 100-watt daylight bulb is used, beetles do not deviate from their course in approaching it. The smaller traps are easier to make and move, and may readily be supported on a ½-in. galvanised iron rod, with an arm 8–10 inches long at the top. The light should be about 5–6 feet above the ground. Baffles made of aluminium appear to be somewhat less effective than those of metal painted a light colour, and this may be due to less even diffusion of light.

Smith (C. L.). **The Relation between the Degree of Fineness of Pyrethrum Powder produced by different Periods of Grinding to Toxicity to Insects and to Deterioration by Light and Air.**—*J. N. Y. ent. Soc.* **44** no. 4 pp. 317–339, 3 pls., 15 refs. New York, December 1936.

In this investigation on the relation of the size of particles of pyrethrum powder to its toxicity to insects and to deterioration by light in air [*cf. R.A.E.*, A **23** 188], the material tested was obtained by grinding Japanese flowers of known pyrethrin content to 5 grades of fineness. The biological effects of these preparations were estimated by the time necessary to produce paralysis in 50 per cent. of a number of larvae of *Culex fatigans*, Wied. (*quinquefasciatus*, auct.), and by the percentage mortality rate in *Aphis rumicis*, L. The results, which are tabulated, show that there was a remarkable decrease in the time required to produce paralysis of the mosquito larvae as the size of the pyrethrum particles decreased, the reason given being that as pyrethrins are only very slightly soluble in water, but are extracted by it to form a colloidal suspension, the greater the surface exposed, the more rapid is the dispersion. Differences in the mortality rate of Aphids, whether treated by dusting or spraying, were of the same order, but were less marked than in the mosquito larvae. In the case of sprays, the explanation is the same, as the suspensions were prepared just before use ; in the case of dusts, it is thought that the pyrethrins dissolve in the moisture and exudate on the insect's integument and enter the body through it or the sensory pores.

A standard light source was provided by a mercury-vapour apparatus, one hour's exposure to the light having the same effect on the powder as a full day of bright June sunlight. When the dusts were exposed to this light, the rapidity of decomposition increased with the fineness of particle-size. Under limited exposure (1½ hours), the pyrethrins in the coarser material were slightly protected by the unbroken plant-cells.

Tests were also made of the value of a pigment (titanium dioxide) and an anti-oxidant (tannic acid) in protecting the powders from deterioration ; the methods of adding them are described. Titanium dioxide was selected as a result of previous work, in which it had been found that pigments that have a high index of reflection or absorption of the light-waves injurious to the toxic principles of derris or pyrethrum, and that also have good covering properties, are most efficient in protecting the powders from deterioration. Both materials afforded a high degree of protection from the effect of exposure to the mercury-vapour lamp for 1½ hours, irrespective of the fineness of the dust. Deterioration had begun to increase after 3 hours, and was again more rapid in the more finely ground dusts, though the ratio was not so great as with unprotected material. Dust treated with titanium dioxide retained its toxicity slightly longer than that treated with tannic acid.

In the case of untreated dust, it would appear that the advantage of quicker kill secured by finer grinding is more than offset by the greater destruction of the toxic principles on exposure to light.

ANDERSON (L. D.) & WALKER (H. G.). **Control of the Potato Flea-beetle,** *Epitrix cucumeris* **Harris.**—*Bull. Va Truck Exp. Sta.* no. 92 pp. 1362–1378, 3 figs., 29 refs. Norfolk, Va, July 1936. [Recd. May 1937.]

Further experiments on the control of *Epitrix cucumeris*, Harr., in Virginia [*cf. R.A.E.*, A **22** 278] were carried out on larger plots of potatoes from 1934 to 1936 with power equipment for dusting and spraying. The figures for the spray formulae show the ingredients in lb. per U.S. gal. water. In 1934, plots sprayed with calcium arsenate and Bordeaux mixture (2 : 4 : 6 : 50) at the rate of 90–100 U.S. gals. per acre produced 190 bushels of high grade potatoes, while plots receiving dusts of calcium arsenate, monohydrated copper sulphate and hydrated lime (25 : 20 : 55) or lead arsenate and lime (1 : 1), both at the rate of 30–35 lb. per acre, produced 162 and 150 bushels, respectively. Untreated plots yielded 120 bushels. The spray was more injurious to the plants than the other treatments.

In 1935, foliage injury by the beetle was measured by counting the number of holes or feeding places on disks (0·568 sq. inch in area) cut from the centres of 5 leaflets taken from each of 3 plants, 25 ft. apart, in the inner rows of the plot. Counts from 1,350 of these gave within 1 per cent. of the results given by counts made of all the holes in the same leaflets. The same spray and dust were used as in 1934 and also a spray (2 : 4 : 50) of calcium arsenate with a commercial neutral copper sulphate (Copper-Hydro " 40 "). They gave 46, 35 and 20 per cent. increase in yield, respectively (these differences being significant), and 89, 56 and 71 per cent. decrease in foliage injury by the beetle. In another experiment, the plots sprayed with the calcium arsenate and Bordeaux mixture (home mixed) gave significantly higher yields than plots sprayed with calcium arsenate alone (2 : 50) or with basic copper sulphate (2 : 2 : 50) ; or dusted with copper sulphate and hydrated lime (25 : 20 : 55) or lead arsenate with lime (1 : 3 and 1 : 1). The yield was not significantly greater than that from a plot sprayed with calcium arsenate with a commercial Bordeaux mixture (2 : 8 : 50).

In 1936, flea-beetles were less numerous, and plants better able to withstand the injury. Tests to determine the best spray programme for the control of *E. cucumeris* with the spray of calcium arsenate with Bordeaux mixture (2 : 4 : 6 : 50) indicated that spraying 6 times at intervals of 7–10 days throughout the growing season gave the highest yield and the best protection for the foliage. Late spraying appeared to be more important than early spraying, as the new brood of beetles [**22** 279] is more abundant and injurious than the overwintered one. There were no significant differences in yields from plots sprayed with calcium arsenate and Bordeaux mixture of different strengths, though weak Bordeaux (3 : 50) gave neither good foliage protection nor as high a yield as the average mixture (6 : 50), while strong Bordeaux (9 : 50) gave better foliage protection with a lower yield. The addition of wetting agents produced no significant differences in yield or injury. A comparison of the effectiveness of the spray of calcium arsenate and Bordeaux mixture with the dust of calcium arsenate, copper sulphate and lime showed that during 4 years the spray increased the yield by 39 per cent., and the dust by 24 per cent., while the latter costs over 3½ times as much for materials. Methods of preparing the spray are given.

HOERNER (J. L.). **Western Rose Curculio** *Rhynchites bicolor wickhami* **Ckl.**—*Bull. Colo. Exp. Sta.* no. 432, 19 pp., 5 figs., 12 refs. Fort Collins, Colo., August 1936. [Recd. 1937.]

An account is given of the bionomics and control of *Rhynchites bicolor* var. *wickhami*, Ckll., on roses in Colorado, and all stages are briefly described. There is one generation a year. From late May to late July, the females deposited eggs singly in the rose-buds after first puncturing the stem of the bud, which later withered and dried up. In the field, more than 1 egg was rarely found in a bud. The larvae hatched in 8–15 days, depending on temperature, and fed inside the dried bud. When mature, they entered the ground and passed the winter ½–2 ins. deep in the soil. Pupation generally occurred in the following April or May, although in a few cases diapause apparently continued until the next spring. In the insectary the larval feeding period lasted 93 and 142 days, but in the field it is possibly as short as 45-50 days. The pupal stage lasted about 9 days, but the adults remained in the soil for about a fortnight. On emerging, they at once started feeding and, in the insectary, made up to 40–50 feeding punctures a day and lived for about 7 weeks. An Ichneumonid of the genus *Temelucha* parasitised 3 per cent. of the larvae.

In laboratory tests against the adults, dusts were more effective than arsenical sprays, apparently because many of the weevils are poisoned in using their mouth-parts to clean their antennae. All the dusts gave 100 per cent. mortality, but undiluted calcium arsenate acted more quickly (in 2-5 days) than sodium fluoride (with lime) or calcium and sodium fluosilicates. Lead arsenate was almost as effective as calcium arsenate. Very promising results with the latter were also obtained in the field. From 70 to 100 per cent. of the larvae were killed by applications to the soil of emulsions containing 0·35 per cent. carbon bisulphide at the rate of 1 U.S. qt. per sq. ft.; lawns and rose bushes were not damaged.

A combination of soil-fumigation, dusting with calcium arsenate, and hand-picking the injured buds and the adults is recommended for control.

WEBSTER (R. L.). **The Relation of Codling Moth to Temperature and Rainfall.**—*Proc. Wash. St. hort. Ass.* **32** (1936) pp. 133–141, 5 figs. Pullman, Wash., 1937.

An attempt is made to correlate temperature and rainfall with the incidence of the codling moth [*Cydia pomonella*, L.] on apple throughout the United States. Temperature is the most important factor influencing the activity of the moth, and egg deposition in the early spring is directly dependent on it. In the eastern States, control is generally not a serious problem where the mean annual temperature is below 50°F. It is difficult, however, in districts in Colorado and Washington, although the mean annual temperatures are 52 and 49·8°F., respectively, but in these areas the annual rainfall is less than 10 ins., and the low humidity appears to accelerate development. In one district in southern New Jersey, where the mean annual temperature and rainfall are about 54·7°F. and 43 ins., control is equally difficult. In Maine, where the mean annual temperature and rainfall are 44·3°F. and 43·0 ins., there is practically only one generation annually. In northern Georgia, where temperatures are very favourable, there may be 3–4 broods a year, but infestation does not show a proportional increase, probably because the populations of natural enemies, including the important parasites, *Trichogramma pretiosum*, Riley, and *Ascogaster carpocapsae*, Vier., are able to build up and exercise greater control. The numbers of broods in States with climatic conditions intermediate between those of Georgia and Maine are discussed at some length. In the non-irrigated sections of the apple-producing areas of the eastern States, lime-sulphur has to be used as a fungicide and, when it is combined with lead arsenate, the protection, as expressed in terms of arsenic per sq. inch of apple surface, is reduced. Even so, control is always easier than it is in the west, where the orchards are close together. Recently, however, measures have had to be increased in western New York, where there has been a succession of long summers with temperatures above the average.

Infestation is less severe in the apple districts of California than on the western slope in Colorado or in the irrigated regions of eastern Washington, where the mean annual temperature ranges from 50 to 52°F. The heaviest spray programmes in the irrigated regions are in those areas where the annual rainfall is less than 12 ins. and the mean annual temperature about 50°F. In eastern Washington considerable losses are sometimes caused by high temperatures in September, which enable late larvae to enter the apples before harvest. In central Washington moth emergence usually begins early in May and the first noticeable peak is reached in the middle of that month. In California it begins in late March, but there seem not to be more than 2 generations annually. The mean annual temperature is about 59°F., but this is due to mild winters, and the summer temperature may be actually lower than in central Washington.

WOLCOTT (G. N.). **The Life History of** *Diaprepes abbreviatus*, **L., at Rio Piedras, Puerto Rico.**—*J. Agric. Univ. P. R.* **20** no. 4 pp. 883–914, 6 figs., 21 refs. Rio Piedras, P.R., January 1937.

Further information, based chiefly on rearing experiments, is given on the life-history of *Diaprepes abbreviatus*, L., attacking *Citrus*, sugar-cane and other plants in Porto Rico [*cf. R.A.E.*, A **23** 113, etc.]. The average length of life of males and females was 123 and 160 days. respectively, the maximum being over twice as long, but as they emerge from the pupae some time before they leave the soil, the actual average period of activity is only about 2, and rather over 4, months. The pre-oviposition period lasts 3–7 days. In the field as well as in captivity, females oviposited more readily between sheets of paper than between leaves [*cf.* **22** 101]. The oviposition period in some cases lasted more than 6 months, and one female laid over 7,000 eggs ; it is thought that about 5,000 are usually laid. The incubation period lasts about a week, and it is apparently unaffected by any ordinary variations in temperature. The newly hatched larvae fall to the ground, entering it through cracks as they are unable to burrow in it [*cf.* **22** 154]. Several days may elapse before food is taken ; the smallest larvae eat roots and, until they are partly grown, appear not to burrow inside their food-supply. There are 6–8 or more larval instars, and the number of days taken to reach the sixth varies from 27 to 126, larvae that hatch in the autumn growing most rapidly. The larval diapause [**23** 113] may last from less than 2 to nearly 13 months and seems not to be dependent on the rate of growth or on climatic factors. The total life cycle may be completed in less than 1 or more than 2 years. Under experimental conditions, the larvae were infested by the mite, *Rhizoglyphus phylloxerae*, Riley, but were apparently unaffected by it. Unhealthy larvae were also attacked by the green muscardine fungus, *Metarrhizium anisopliae*, but it is thought that the resulting mortality would be negligible in the field. Details of the life-history of 24 individuals are appended.

[ZAKHVATKIN (A. A.).] **Захваткин (А. А.). Les habitats naturels des Tyroglyphes nuisibles aux denrées.** [*In Russian.*]—*Zool. Zh.* **15** no. 4 pp. 697–719, 12 refs. Moscow, 1936. (With a Summary in French.)

Investigations carried out in May-September 1935 in various parts of European Russia showed that 12 of the 19 species of grain mites (Tyroglyphids and Glycyphagids) that have been recorded in the Russian Union can be found in fields, meadows, or forests. The different habitats in which the mites occurred are discussed in detail ; the only permanent habitats were burrows of field rodents, but some temporary shelters, such as hay ricks, heaps of straw or cereals, and large accumulations of the débris near threshing floors and granaries, were occupied for a long time, as they maintain conditions of humidity favourable to the mites. Shelters used for only a short time comprise small accumulations of dead grass, plants and dry leaves on the ground. Mites were also found in stubble or in the soil in cultivated fields, and on the underground parts of cereals. They occur in numbers in accumulations of plant material if a high degree of humidity is maintained for a considerable time ; in the case of hay or straw, the moisture content must not be less than 12 per cent.

[SMARAGDOVA (N. P.).] **Смарагдова (Н. П.). The Interaction between phytophagous and predatory Mites in Relation to their Environment and Concentration.** [*In Russian.*]—*Zool. Zh.* **15** no. 4 pp. 720–730, 6 graphs, 6 refs. Moscow, 1936. (With a Summary in English.)

Details are given of investigations on the interrelation between *Aleuroglyphus ovatus*, Troup., and *Cheyletus eruditus*, Schr., which is predacious on it in a variety of media, including wheat flour. The results have already been noticed from a briefer account [*R.A.E.*, A **24** 554], in which, however, the first mite was recorded as *A. agilis*.

[IVANOV (S. P.) & SAVCHENKO (E. N.).] **Иванов (С. П.) и Савченко (Е. Н.). The Development of *Bothynoderes punctiventris* in the Soil in Connection with the Cold-resistance of its various Stages.** [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 5–14. Leningrad, 1936.

Observations on the beet weevil, *Cleonus* (*Bothynoderes*) *punctiventris*, Germ., in central Ukraine during 1927–34 showed that the fall in soil temperature in that part of the beet growing area in autumn is very gradual, so that the bulk of the weevils, which hibernate at a depth of 4–10 ins., are not subjected to any considerable fluctuations of temperature or severe cold. The larval stage was found to average 65 days, and the prepupal and pupal stages together 23–24. The threshold of development of first-instar larvae, which occur mostly in June-August, was 11–14°C. [51·8–57·2°F.], whereas those of fifth-instar larvae and pupae, which usually develop in cooler months, were 5–8°C. [41–46·4°F.] and 3–6°C. [37·4–42·8°F.], respectively. Since the soil temperature in central Ukraine does not drop below the threshold of development before mid-November, a large number of larvae and pupae are able to transform into adults in the autumn, and this accounts for their absence in the spring. Laboratory tests showed that the resistance to cold of the various stages of the weevil varies inversely with the amount of free water in the body and directly with the amount of fat-body [*R.A.E.*, A **17** 126]. The mean critical temperatures (at which a mortality of over 90 per cent. occurred) were between −20 and −22°C. [−4 and −7·6°F.] for the newly-emerged adults that remain in the soil in the autumn and not lower than −12°C. [10·4°F.] for the pupae, fifth-instar larvae, overwintered adults taken in the soil in the spring, or active weevils. As the temperature of the soil in central Ukraine decreases below the lethal freezing point of the hibernating stages of the weevil only in exceptionally cold years, and then only down to a depth of 4 ins. in the soil, the weevils are hardly ever frozen to death.

Large numbers of larvae and pupae are, however, killed by the muscardine fungi, *Metarrhizium* (*Penicillium*) *anisopliae* and *Tarichium* *uvella.* About the middle of October, some 70 per cent. are killed by muscardine fungi and 10–20 per cent. by other fungi, bacteria, predators and parasites. Mortality is highest in cool rainy years, when the development of the larvae and pupae is protracted.

[KORAB (I. I.), SAVCHENKO (E. N.) & YARMOLENKO (I. M.).] **Кораб (И. И.), Савченко (Е. Н.) и Ярмоленко (И. М.). Chloropicrin in the Control of** *Bothynoderes punctiventris* **Germ.** [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 15–29, 1 graph, 22 refs. Leningrad, 1936.

Tests of soil fumigation with chloropicrin against *Cleonus* (*Bothynoderes*) *punctiventris*, Germ., in beet fields were made in central Ukraine in 1933–35. Injection of from 5 to 80 gm. chloropicrin about mid-July at a depth of 6 ins. killed all the larvae within a radius of 8 ins. in 3 days ; 15–80 gm. killed 70–95 per cent. within 12 ins. in 3 days, and 30 gm. killed all in 6 days. At further distances from the points of injection, there was a sharp decrease in mortality. When applied against the adult weevils in the first half of September, injection of 10–30 gm. killed all within a radius of 8 ins. in 6 days. In experiments in which injections were made at regular intervals from 14 to 28 ins. apart, the adult weevils proved in all cases to be the most resistant and the pupae the least so ; the resistance of the larvae increased with age. Wide spacing of the injections reduced the effectiveness of the treatment. The best results were obtained with 14-inch spacing, which gave complete mortality of all stages in 6 and 14 days, when the fumigant was applied at rates of 900 and 450 lb. per acre, respectively. Treatment was less effective in moist soil.

Chloropicrin applied in the form of gas, which was obtained by blowing hot air through a glass tube containing the liquid and introducing the vapours into the soil by means of a metal tube, proved to be much less effective than the liquid itself, owing to the decomposition of the fumigant when brought in contact with heated metal [*cf. R.A.E.*, A **18** 131] and a too quick evaporation from the soil.

Though effective in liquid form, chloropicrin is at present too expensive to use for the control of *C. punctiventris* in the Russian Union.

Of the other fumigants tested, calcium cyanide and chlorine were almost ineffective, but paradichlorobenzene killed all the larvae in 14 days when applied at 4 points per square metre at the rate of 650 lb. per acre. Good results were also obtained with 325 lb. per acre when it was introduced at 8 points per sq. m.

[SKOBLO (I. S.).] **Скобло (И. С.). The Feeding and Fecundity of** *Loxostege sticticalis* **L. 3rd Report. Determination of Fecundity in the Moth by the Size of Wings.** [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 30–39, 29 refs. Leningrad, 1936. (With a Summary in English.)

Further investigations in Leningrad [*cf. R.A.E.*, A **25** 275] showed that the fecundity of the females of *Loxostege sticticalis*, L., could be determined from the size of the right forewing of the moths instead of from the weight of the pupae, as the two are correlated. The observations were made on moths reared from larvae fed continuously or intermittently. The coefficients of correlation between the area and length of the wing and pupal weight were 93·8 and 84·8 per cent., respectively. Thus, pupae that weighed 10–13, 46–48 and 49–52 mg. produced moths having right fore-wings with average areas of 13·6, 37·9 and 38·7 sq. mm., respectively, and pupae that weighed 10–15 and 46 or more mg., produced moths with average wing-lengths of 7·66 and 11·88 mm. Dissection of females given water only showed that 75 per cent. of those having an average wing area of 30 sq. mm. (pupal weight 26–30 mg.) did not mature eggs and remained sterile, as compared with only 23 per cent. of those with a wing area of 34·1 sq. mm. (pupal weight 36–40 mg.). The larger moths also lived longer when given water ; thus, groups of females with a pupal weight of 20 mg. or lower, and an area and length of wing of 19·9 sq. mm. and 8·2 mm. only lived 5 days, whereas those with a pupal weight of 41–45 mg. and wing measurements of 37·1 sq. mm. and 11·5 mm. lived 14·4 days. When given water, moths with a mean pupal weight of 36 mg. and a wing area of 33 sq. mm. deposited an average of 156 eggs and those with a pupal weight of 47 mg. and a wing area of 38 sq. mm. deposited 212. The figures for mean fecundity of individuals fed on 5–10 per cent. sugar solution were 124 and 368 eggs, respectively, for moths with pupal weights of 20 and 36 mg., wing areas of 20 and 37 sq. mm., and wing lengths of 8·2 and 11·5 mm. For practical purposes, the easiest way to determine the fecundity of females of *L. sticticalis* would be from wing length.

[KOZHANCHIKOV (I. V.).] **Кожанчиков (И. В.). The Rôle of ecological Factors in the Distribution of** *Pieris brassicae* **L.** [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 40–57, 3 graphs, 1 map, 30 refs. Leningrad, 1936. (With a Summary in English.)

Laboratory studies in Leningrad showed that the minimum and maximum temperature limits within which the biological processes can take place in the individual stages of the first generation of *Pieris brassicae*, L., are as follows : incubation and hatching, 9–32·4°C. [48·2–90·32°F.] ; larval development, 10·7–38°C. [51·26–100·4°F.] ; pupation, 6–38°C. [42·8–100·4°F.] ; and oviposition, 16–35°C. [60·8–95°F.]. In the case of the second generation, the larvae developed at 3–37°C. [37·4–98·6°F.] and pupation occurred at 5–36·5°C. [41–97·7°F.]. The findings of the author are compared with data obtained by Klein and Maercks [*R.A.E.*, A **20** 658 ; **22** 671]. Experiments showed that an uninterrupted sequence of generations is possible if the larvae develop at temperatures above 22°C. [71·6°F.], as then the pupal stage is short and most of the pupae do not diapause even if they are exposed to a temperature of 14–15°C. [57·2–59°F.]. On the contrary, larval development at temperatures below 22°C. causes the resultant pupae to diapause. The thermal constant of total development, obtained by adding the thermal constants of each stage, was calculated to be 700·5 day-degrees C. [1260·9 F.]. The egg stage required 98 day-degrees C. [176·4 F.], the larval and prepupal stages together 389 [700·2], the pupal 189 [340·2], and the maturation of the eggs in the females 24·5 [44·1], the thresholds for these stages being 9, 7, 8 and 16°C. [48·2, 44·6, 46·4 and 60·8°F.], respectively.

From a study of the literature and examination of museum collections, the author concludes that the geographical range of *P. brassicae* is chiefly limited to Europe, the boundary in the north-east coinciding with the January isotherm of -16 to -20°C. [3·2 to -4°F.] and minimum winter temperatures of -30 to -35°C. [-22 to -31°F.], which the pupae in the field are apparently able to withstand. The cold-hardiness of the pupae varies, however, in different areas and different years, depending on the conditions of development of the larvae and on ecological factors during the winter. In western Europe, and partly in Karelia, *P. brassicae* occurs further north than in the east. The southern boundary of its range coincides with the July isotherm of 28°C. [82·4°F.] and maximum summer shade temperatures of 37–40°C. [98·6–104°F.]. It is most abundant in the Baltic region, this being probably due to favourable temperature and humidity conditions there, the hydrothermic coefficient of the region being 8, as compared with coefficients of only 1–2 found in the south of the area of its distribution, which is apparently unfavourable for the development of the eggs and the maturation of the females. The hydrothermic coefficient is obtained by dividing the precipitation in mm. for the period during which the temperature is above the lower limit for development of the insect by the sum of mean monthly temperatures above 5°C. The area of distribution of *P. brassicae* is divided into 4 zones, in which 1, 2, 3 or more generations a year, respectively, are produced. In such places as Tashkent, Ferghana or Naples, 4–5 generations may occur, but the high temperature during the summer causes a great reduction in the abundance of the insect.

[SAZONOV (P. V.) & SKRYABINA (E. A.).] **Сазонов (П. В.) и Скрябина (Е. А.). The metatoxic Effect of Stomach Insecticides.** [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 72–82, 3 graphs, 16 refs. Leningrad, 1936. (With a Summary in English.)

With the view to determining to what extent the after-effect of poisoning should be taken into consideration when using baits for the control of *Locusta migratoria*, L., laboratory experiments were carried out in Leningrad with sodium arsenite and sodium fluosilicate. The poisons were given to third-instar hoppers, and the survivors and the offspring of those that matured and oviposited were kept under observation. Neither poison caused a high rate of mortality of hoppers that had survived the third instar after having been given high or low dosages, the maximum percentages of mortality in subsequent instars being 24·5 for sodium arsenite and 20·7 for sodium fluosilicate. Sodium arsenite caused some reduction in the speed of development and weight of the hoppers, but sodium fluosilicate did not. The after-effect of poisoning was more evident in the second generation, since 67·8 and 45·5 per cent. of the eggs laid by females poisoned with the arsenite and fluosilicate, respectively, failed to hatch, though they contained fully developed embryos. The hoppers that did hatch, however, were in no way abnormal. In similar experiments with sodium fluosilicate and sixth-instar larvae of *Lymantria* (*Porthetria*) *dispar*, L., the after-effect of poisoning was not great. The number of eggs laid by the moths was considerably reduced only if doses of poison large enough to kill 72–79 per cent. of the larvae were used; and the percentage of eggs that failed to hatch was large only if the moths had received almost lethal doses as larvae.

It is concluded that, in the case of *L. migratoria*, complete mortality of the generation following the poisoned one will take place only if the latter has been given doses of sodium arsenite or sodium fluosilicate that would kill over 20 and 50 per cent., respectively, in a few days. In the case of *P. dispar*, the required dosage would kill over 75 per cent. in the first few days. As, in practice, individual insects will consume different amounts of poisoned bait or foliage, it does not appear advisable to reduce dosages of insecticides and rely on their after-effect.

[VAVILOV (I. F.).] **Вавилов (И. Ф.). The Testing of *Pyrethrum* against Fruit Tree Pests.** [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 83–88. Leningrad, 1936.

An account is given of insecticide tests with extracts and dusts made from Dalmatian pyrethrum [*Chrysanthemum cinerariaefolium*] cultivated in the Crimea. The extracts were prepared by soaking the ground flowers or stems in water, kerosene or 80 per cent. ethyl alcohol for 3–5 days and then filtering the liquid. The water and alcohol extracts used at various dilutions, either with or without the addition of soft soap, and the kerosene extracts were made into paste emulsions with tripoli earth and also used at various dilutions. The tests were carried out on *Myzus* (*Myzodes*) *persicae*, Sulz., on peach by immersing severely infested branches in the liquids for ½–2 minutes, and by spraying individual infested branches from a hand apparatus in the field. The results, which were estimated after 24 hours, showed that the water extracts were completely ineffective, and the kerosene extracts only slightly increased the toxicity of the emulsion, positive results being also obtained when the latter was used alone. The ethyl alcohol extracts prepared from 1 part flowers or stems to 17 parts solvent and containing 0·03 and 0·02 per cent. pyrethrins, respectively, proved to be the most effective ; they gave very good results at dilutions of up to 1 : 50, and the extract from the flowers killed 90 per cent. of the Aphids at 1 : 100. Tests with diluted ethyl alcohol alone showed that the mortality was entirely caused by the pyrethrins.

The dusts tested consisted of finely ground powder of dry flowers containing 0·43 per cent. pyrethrins mixed with lime ; they were applied in the laboratory at 23°C. [73·4°F.] and a relative humidity of 75 per cent. against larvae of the apple moth [*Hyponomeuta padellus malinellus*, Zell.] in nests on cut branches and in the orchard against larvae of the third and fourth instars in nests on apple trees in June. The best results were obtained with dust containing 1 part pyrethrum to 3 parts lime, which destroyed all the larvae in the laboratory and 93 per cent. of those on the trees in 3 days.

[POPOV (K. I.) & FIRSOVA (A. V.).] **Попов (К. И.) и Фирсова (А. В.). The Influence of environmental Conditions on the Biology and Injuriousness of *Aphthona euphorbiae* Schr. and *Longitarsus parvulus* Payk.** [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 94–102, 1 graph. Leningrad, 1936.

Observations on the flea-beetles, *Aphthona euphorbiae*, Schr., and *Longitarsus parvulus*, Payk., on flax in the district of Kazan in 1935 showed that the adults abandon their hibernation quarters when the average (day and night) air temperature reaches 9–12°C. [48·2–53·6°F.] and the maximum temperature on the soil surface is not less than 20°C. [68°F.]. Moist soil retards emergence, and dry soil accelerates it. The time of the migration of the beetles to flax largely depends on temperature, 26–27°C. [78·8–81·6°F.] being the optimum conditions for mass migration, though individuals may begin to migrate at 15–16°C. [59–60·8°F.] if the flax is close to the hibernation quarters. In 1935, the beetles appeared on 8th–9th May, migrated to flax on 22nd May and began markedly to decrease in numbers between 20th and 26th June. The adults of the new generation were emerging from 21st July to 15th August, the average temperature then being 19·9°C. [67·82°F.]. Other activities of the beetles, including feeding, pairing and oviposition, also increased as the temperature rose.

Observations on plots of flax sown on 12th, 20th and 27th May showed that infestation at the time of sprouting was lowest on the earliest sowing and highest on the latest. At the time of stem formation, however, infestation was most severe on the flax sown on 20th May, the difference being due to the change in the temperature on the surface of the soil as the season advanced. The effect of injury to the cotyledons on the further development of the plants depended on conditions of growth and chiefly on rainfall between sprouting and flowering. Thus, 59·7 and 105·8 mm. rain fell during this period of growth in the early and later sown flax, respectively, and the yield of dry matter and especially seeds by the former was less, although it had suffered less initial injury. Covering the newly sown flax with a layer of straw 1–3 ins. thick reduced injury by 85·4 per cent. at the time of sprouting and by 59 per cent. at the phase of stem formation, as, owing to the light colour of the straw and the shade produced, the temperature on the surface of the soil and at the level of the cotyledons was lowered and unfavourable to the flea-beetles. As a result, the yields of straw and seeds from the mulched flax were 25 and 20 per cent. higher, respectively, than those from the control. In the cold and wet summer of 1935, mulching itself was rather detrimental to the flax plants, so that even better results might be expected in a hot, dry summer.

[VASIL'EV (I. V.).] **Васильев (И. В.). Pests of Lupin** (*Lupinus*). [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 103–108, 19 refs. Leningrad, 1936.

Of the pests of lupins observed in 1930–31 in White Russia, where *Lupinus angustifolius* and *L. luteus* are extensively cultivated, the most important was the weevil, *Sitona grisea*, F., which also occurs in the Western Province and the Ukraine. The adults that have overwintered often destroy the sprouting plants at the end of April or beginning of May and later feed on the leaves ; and those that appear in the second half of summer destroy the tips of plants that are producing seed. The larvae hollow out the nodules on the roots, so that their ability to fix nitrogen is considerably reduced. The young plants were often attacked by wireworms, particularly *Corymbites* (*Selatosomus*) *aeneus*, L., and *Athous obscurus*, Payk. (*haemorrhoidalis*, F.). Of the Lepidoptera, *Euxoa* (*Feltia*) *segetum*, Schiff., and *Feltia exclamationis*, L., were the most injurious, but larvae of *Pyrausta nubilalis*, Hb., were sometimes found in the main stems of mature plants of non-alkaloid (sweet) lupin, causing them to break. Severe damage was caused by *Phorbia* (*Chortophila*) *trichodactyla*, Rond., and *P.* (*C.*) *cilicrura*, Rond., which often destroyed up to 50 per cent. of the germinating seeds and very young plants of *L. angustifolius*. As two generations of these flies develop in the course of the spring and summer, lupins sown at different dates were infested. The Anthicid, *Notoxus* *monoceros*, L., feeds on the spores of the fungus, *Erisiphae communis* f. *lupini*, which attacks the yellow lupin (*L. luteus*) and is apparently concerned in their transmission.

A list is given of 53 pests of lupin that have been recorded in the Russian Union or western Europe.

[GERSHUN (M.) & MERPULATOVA (S.).] **Гершун (М.) и Мерпулатова (С.). The Effectiveness of Spraying with Lime Sulphur.** [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 135–137. Leningrad, 1936.

With the view to determining the effectiveness of spraying fruit trees in autumn and spring with lime-sulphur, a survey was made in the summer of 1935 in central and eastern Uzbekistan of orchards that had been regularly or occasionally treated during the last four years. About 75 per cent. of the trees were apples, and it was these that were examined for the presence of insect pests. The percentage attacked by the Tineid, *Coleophora hemerobiella*, Scop., the Tortricids, *Recurvaria nanella*, Hb., and *Eucosma* (*Tmetocera*) *ocellana*, Schiff., and leaf Aphids, and the intensity of infestation, were found to decrease in direct proportion to the number of years during which spraying had been carried out. Systematic spraying had, however, failed to control *Parlatoria oleae*, Colv., which is protected by a hard scale in autumn and spring ; in many instances it was actually more abundant on sprayed trees, which may have been due to the destruction of entomogenous fungi by the lime-sulphur.

[GLUSHENKOV (N. A.).] **Глушенков (Н. А.). The Effectiveness of poison Baits against** *Chloridea obsoleta*. [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 137–140. Leningrad, 1936.

Experiments with poison baits against larvae of *Heliothis armigera*, Hb. (*Chloridea obsoleta*, F.), on cotton were carried out in southern Uzbekistan. The baits were mixtures of finely ground dry cotton oil-cake with 3–10 per cent. by weight of calcium arsenate, calcium arsenite or barium fluosilicate. They were applied in the evening, at the rate of 36 lb. per acre, chiefly to the plants themselves, as the larvae seldom descend to the ground. All the baits gave good results, except those containing barium fluosilicate. The percentage of mortalities of the larvae on the 3rd and 6th days after treatment were : 58·2 and 83·8 for a bait mixed with 3·3 per cent. of calcium arsenate prepared from scorodite ore and containing 34·9 per cent. As_2O_5 ; 70·8 and 91·2 per cent. for one with 9·1 per cent. of the same arsenate ; 41·2 and 68·8 for one with 3 per cent. of calcium arsenate containing 34·1 per cent. As_2O_5 ; and 53·6 and 83·6 for one with 10 per cent. of calcium arsenite containing 66 per cent. As_2O_3. It is recommended that the cotton oil-cake should be ground fine and well sifted so as to cover the plants thoroughly.

[BEZDENKO (T. T.).] **Безденко (Т. Т.). The Use of Sodium Silicofluoride against** *Operophtera brumata* **and other Pests.** [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 140–141. Leningrad, 1936.

Orchards in White Russia are severely infested every year by *Operophtera brumata*, L. At the end of May 1935, when the air temperature was over 20°C. [68°F.] and the weather fine, sprays of

Paris green, calcium arsenate and sodium fluosilicate were applied to apple trees infested by larvae of *O. brumata*, *Erannis defoliaria*, Cl., and, in small numbers, *Eucosma* (*Tmetocera*) *ocellana*, Schiff., *Tortrix* (*Cacoecia*) *rosana*, L., and *Diloba coeruleocephala*, L. Sodium fluosilicate used at the rate of 5–6 or 10 lb. to 100 gals. water had killed 99 per cent. of the larvae by 1st June and all by 4th June. Slight scorching was caused by the stronger spray, but none by the weaker one. Sprays of 2 lb. calcium arsenate and 1 lb. Paris green per 100 gals. water killed only 20 and 15 per cent. of the larvae, respectively.

In special experiments in 1936 to test the effect of a spray of 6 lb. sodium fluosilicate in 100 gals. water on the young leaves and young larvae of *O. brumata* and Tortricids, the trees were sprayed on 12th May at a temperature of over 20°C. and in sunny weather. The larvae began to descend to the ground 2 hours after spraying, and all were dead in 10 hours. No scorched leaves or flowers were observed three days later.

[SHEK (G. Kh.).] **Шек (Г. Х.). On the Injuriousness of Red Spider on Vine.** [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 142–143. Leningrad, 1936.

Vines in central Azerbaijan are seriously injured by *Tetranychus telarius*, L. (*Epitetranychus althaeae*, v. Hanst) [*cf. R.A.E.*, A **15** 126; **21** 10]. As a rule, pubescent varieties are preferred, though some that have only slightly hairy leaves are also severely infested. The young shoots are deformed, and the leaves become spotted and then dry up and fall. As a result of the decrease of foliage, the grapes lose much of their sugar content and the must is sour. Owing to the fact that the spring in Azerbaijan is usually damp and the mites do not become abundant until the summer, especially July-August, when it is dry and hot, some of the vineyards escape severe infestation. The application of sulphur at the time of the appearance of the young larvae is effective. Spraying with dolphin-oil soap kills large numbers of the mites, but injures the foliage.

[ÉSTERBERG (L. K.).] **Эстерберг (Л. К.). On the Biology of *Apion meliloti* Kby.** [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 144–146, 1 fig. Leningrad, 1936.

In the Province of Gor'kiĭ, white sweet clover [*Melilotus alba*] is often infested by *Apion meliloti*, Kby. This weevil has two generations annually, the first of which develops exclusively on plants sown in the preceding year. Adults that have hibernated in the upper layer of the soil occur on these plants from mid-May to late July and feed on the leaves and stems. Oviposition begins at the end of May, the eggs being laid singly in pits gnawed in the tissues of the plant. These pits are first made in the upper part of the roots and later, as the plants grow, in the stems; as a result, young larvae are found in the root and root collar in mid-June, whereas later the first pupae and young adults occur there and the young larvae in the stems. In 1935, pupation began at the end of June and adult emergence early in July. The exit holes of the weevils are clearly visible on the stems. Some of the young weevils migrated to, and oviposited on, the sweet clover sown the same year, but most of them remained in the second-year fields and oviposited in the young shoots or soft upper parts of the stems.

Oviposition began almost as soon as the weevils emerged and was at its height in the second half of July. Second-generation larvae and pupae could both be found from July to the end of September. The young weevils emerged from 3rd August onwards, but did not feed and soon entered the soil for hibernation.

The economic importance of *A. meliloti* has not yet been ascertained, as white sweet clover is more severely attacked by it when growing wild than when cultivated. Larvae and pupae of both generations were attacked by an unidentified endoparasite, the adults of which emerged in the laboratory on 27th July, and which hibernated in the pupal stage in stems that had been infested by the host larvae.

[Vasil'ev (I. V.).] **Васильев (И. В.). Summaries of Reports of the Scientific Research Institutes of Plant Protection for the Year 1935.** [*In Russian.*]—*Plant Prot.* fasc. 11 pp. 149–157. Leningrad, 1936.

In this series of summaries of unpublished reports by various authors, the following are of entomological interest :

Potaraya [Pataraya] (Sh.). **The Maize Moth as a new Pest of Tea and Citrus Cultures** (p. 149). This is an abstract of information already noticed on *Pyrausta nubilalis*, Hb., in Georgia [*R.A.E.*, A **23** 578].

Potaraya [Pataraya] (Sh.). **Test of Alkaline Residues of Solar Oil** (p. 149). Emulsions made of alkaline residues obtained in the refining of solar oil were tested against pests of tea in Transcaucasia. At concentrations of 5–7 per cent., they killed 89–91 per cent. of *Toxoptera aurantii*, Boy. (*theaecola*, Buckt.), 90–91 per cent. of *Pulvinaria floccifera*, Targ., and 96–98 per cent. of *Eriophyes theae*, Watt. Higher concentrations scorched the buds and leaves and caused little increase in the rate of mortality. The spray should be applied after the leaves have been picked, and they should not be picked again for 6–7 days.

Potaraya [Pataraya] (Sh.). **Test of Control Measures against the small brown Beetle** (p. 150). This beetle, which is here recorded as *Aserica castanea*, Arr. [*cf. R.A.E.*, A **24** 590], chiefly occurs in the southern part of Georgia, where it attacks *Citrus*, sweet potatoes, egg-plants, tomatos and the leaves of young tea seedlings. Spraying with 1 lb. Paris green and 2 lb. lime in 80 gals. water killed 69 per cent. of the beetles, and 40 per cent. calcium arsenate dusts killed 72 per cent. Hand collection of the beetles and destruction of weeds by hoeing or cultivating the soil at the time of pupation reduced their numbers.

Potaraya [Pataraya] (Sh.). **Study of the Species of Scales, Determination of the Area of their Distribution in the Tea Regions and their Control** (pp. 150–151). Of the six Coccids found on tea in Georgia, *Pulvinaria floccifera*, Westw., and *Aspidiotus destructor*, Sign., are serious pests, and *A. cyanophylli*, Sign., *A. rapax*, Comst. (*Hemiberlesia camelliae*, Sign.), *Ceroplastes cirripediformis*, Comst., and *Parlatoria* (*Singenaspis*) *theae*, Ckll., are of no importance on tea. *P. floccifera* chiefly attacks old plantations and decreases the yield of the leaves by 35–40 per cent. A 2–3 per cent. solution of dolphin-oil soap and a 7 per cent. emulsion of the alkaline residues of solar oil give 78–89 and 90 per cent. mortality, respectively, if applied before the scales of the insects have formed. These sprays should be applied in autumn or early spring, after the pruning of the bushes, and in the summer immediately after picking the leaves. *A. destructor* has 2 or 3 generations a year. Sprays of 0·07 per cent. anabasine sulphate and 0·05 per cent. nicotine sulphate, each with the addition of dolphin-oil soap (1 lb. to 12 gals.), gave 89·1 and 86·4 per cent. mortality before scale-formation.

VUL'FSON (R.). **Pests and Diseases of Vegetables observed in 1935 in the Far East Region** (pp. 152–153). The chief pests recorded include *Pieris rapae*, L., and *Brevicoryne brassicae*, L., on cabbage, *Epilachna vigintioctopunctata*, F., on potatoes, *Agrotis* (*Feltia*) *ypsilon*, Hfn., on beet, and *Hylemyia antiqua*, Mg., on onions.

KAGANOVA-KHARNSKAYA (—). **Test of Insectofungicides and Determination of Dosages for the Control of Pests and Diseases of Vegetables** (pp. 153–154). In experiments in the Russian Far East, spraying with anabasine sulphate at concentrations of 0·1 and 0·2 per cent. gave 100 per cent. mortality of the cabbage aphis, *Brevicoryne brassicae*, L., in 24 hours, and good results against *Aphis gossypii*, Glov., on cucumbers in greenhouses were obtained even with a 0·05 per cent. concentration. Of the insecticides used against the potato beetle, *Epilachna viginti-octopunctata*, F., baits made of bran containing 2½ per cent. Paris green or sodium fluosilicate by weight gave complete mortality. Calcium arsenate dust killed 47 per cent. of the adults and 80 per cent. of the larvae, or 42 and 64 per cent., respectively, when it was mixed with equal parts of carrier. Paris green dust with a carrier gave 80–90 per cent. mortality at a concentration of 1 : 7 in the laboratory, and 30 per cent. at 1 : 5 in the field. A 0·15 per cent. Paris green spray mixed with glue or sugar and lime gave 57 per cent. mortality. In the case of *Pieris rapae*, L., a 50 per cent. dust of sodium fluosilicate gave a complete kill.

ENGEL'HART (V.). **Insects that injured agricultural Crops in 1935 within the Boundaries of the Ussuri and Maritime Provinces** (p. 154). Owing to cold and wet weather, most of the crops were only slightly infested. Of the Diptera attacking cereals, *Meromyza saltatrix*, L., was the most common, though barley was severely injured by *Hydrellia griseola*, Fall. Other pests were *Cirphis unipuncta*, Haw., on wheat, *Pyrausta nubilalis*, Hb., on maize, and *Cydia* (*Laspeyresia*) *glycinivorella*, Mats., on soy beans.

ENGEL'HART (V.). **Flies injurious to Cereals in the Far East Province** (p. 154). Owing to the unfavourable weather that usually prevails in the spring, cereal flies are of secondary importance, only from 0·5 to 5 per cent. of the chief crops being injured by them. *Hydrellia griseola*, Fall., attacks barley only in damp springs, otherwise it infests early varieties of rice, though not to any appreciable extent. *Meromyza saltatrix*, L., and *Chlorops* sp. are more important than *Oscinella* (*Oscinosoma*) [*frit*, L.].

PLYATER-PLOKHOTZKAYA (V.). *Meromyza saltatrix* L. (pp. 154–155). In the Russian Far East, *Meromyza saltatrix*, L., has three generations a year, and infests rye, barley, oats, Timothy grass [*Phleum pratense*] and, especially, wheat and couch grass [*Agropyrum*], the last-named being the chief food-plant of the second generation. The plants are attacked only in the early phases of development, and injury to one stem stimulates the development of others. Control should chiefly consist in destruction of weeds, especially couch grass.

VERESHCHAGIN (V.). **Investigations on Control Measures against Wireworms** (p. 157). The seasonal migrations of wireworms in the soil depend on humidity and temperature, and on the species concerned. *Corymbites* (*Selatosomus*) *latus*, F., is economically more important than *Agriotes sputator*, L., as it occurs nearer to the surface of the soil in spring. Up to 25 larvae to 2 sq. yards of a field under wheat is not dangerous, whereas 50–100 will be responsible for severe damage, and over 100 will destroy the crop. In the case of *A. sputator*, the danger from the same numbers of larvae is decreased by half. In loose soil the larvae move at the rate of about a yard in 5 days.

ZILLIG (H.). **Das Vordringen des bekreuzten Traubenwicklers** (*Polychrosis botrana* **Schiff.**) **in den deutschen Weinbaugebieten.** [The Advance of *P. botrana* in the German Vineyard Regions.]—*Arb. physiol. angew. Ent. Berl.* **4** no. 2 pp. 81–94, 13 refs. Berlin, May 1937.

Notes are given on the history and distribution in Germany of *Polychrosis botrana*, Schiff., which during the past thirty years has greatly increased in abundance on vines, is still spreading, and has become second in importance to *Phylloxera*. In warm districts near the Rhine and Moselle, it predominates over the native vine-moth, *Clysia ambiguella*, Hb., which is less important, probably because its more sharply defined stages render it easier to control, one application of an arsenical spray sufficing against the larvae of each of the two generations. In the case of *P. botrana* a second application with a contact insecticide is usually required against both generations, or a mixed spray against the summer one. Heavy infestations by this generation necessitate a still further application of a contact poison.

NITSCHE (G.) & MAYER (K.). **Untersuchungen über die Lebensgeschichte der Rübenblattwanze. VI.** [Investigations on the Biology of the Beet Leaf Bug. VI.]—*Arb. physiol. angew. Ent. Berl.* **4** no. 2 pp. 94–104, 6 figs., 10 refs. Berlin, May 1937.

The characters differentiating the species of *Piesma* that have been found on beet in Germany are tabulated and described; they are *P. quadrata*, Fieb., *P. quadrata* var. *dilatata*, Jak., *P. maculata*, Lap., *P. maculata* var. *viridis*, Jak., and the brachypterous and macropterous forms of *P. capitata*, Wolff. *P. quadrata*, which is the species of importance as a pest of beet [*cf. R.A.E.*, A **17** 640, etc.], represented 86·5 per cent. of these Tingids collected in their winter quarters in 1935–36. They seek dry, warm places for hibernation and have only exceptionally been found in damp ground rich in humus. *P. quadrata* does not avoid dense forest stands and was found hibernating in litter as far as 600 ft. within a pine wood. Observations on the cause and intensity of the flight of *Piesma* spp. from 28th April to 30th May to determine the correct date for ploughing under the beet strips used as traps against *P. quadrata* [*R.A.E.*, A **25** 282, etc.] were inconclusive. In 1936, most of the second-generation nymphs developed only to the third or fourth instar, owing to cold, rainy weather. As this second generation has been known to oviposit, it may be assumed that climate regulates the number of generations, and this is supported by the fact that five generations were bred in the laboratory at controlled temperatures. *P. quadrata* was bred from egg to adult on wild Chenopodiaceae and even on a composite, *Aster trifolium* [*cf.* **16** 1] when the eggs were placed on these plants, but it did not feed on them after being bred on beet. Investigations on the transmission by it of the virus of crinkle showed that the duration of sucking and number of bugs were quite unimportant, though the development of the disease is probably promoted by the weakness in the plant, due to the larger amount of sap lost and the greater amount of saliva, which has a fermentative action. Inoculation experiments with the expressed juice of diseased beet and the grafting of diseased parts produced no typical crinkle, but a marbling of the heart leaves was often noticed. Transmission experiments with *P. maculata* and *P. capitata* gave negative results.

TISCHLER (W.). **Zur Biologie des stumpfschwarzen Getreideschimmelkäfers** (*Alphitobius ovatus* **Hrbst.**). [A Contribution to the Biology of *A. ovatus*.]—*Arb. physiol. angew. Ent. Berl.* **4** no. 2 pp. 105–109, 5 figs. Berlin, May 1937.

Adults of the Tenebrionid, *Alphitobius diaperinus*, Panz. (*ovatus*, auct.), have for some years been found in a bakehouse at Kiel, living in cracks in the walls and floor and coming out at night to feed on the flour scattered on the floor. All stages are briefly described. Laboratory experiments, chiefly at 30°C. [86°F.] and 35–45 per cent. humidity, showed that oviposition took place within a day of pairing, and that the egg, larval and pupal stages lasted 5·3, 34 and 5·5 days, respectively. The larvae fed on flour and dried hard bread, particularly if mouldy. The adults fed on flour, dried bread, and dead insects. From observations on the instars of several individuals at ordinary room temperature, the author concludes that larval development may require about a year.

GÖRNITZ (K.). **Cantharidin als Gift und Anlockungsmittel für Insekten.** [Cantharidin as a Poison and Attractant for Insects.]—*Arb. physiol. angew. Ent. Berl.* **4** no. 2 pp. 116–157, 6 figs., 39 refs. Berlin, May 1937.

A detailed account is given of investigations in Germany on the use as an insecticide and the attractiveness to certain insects of cantharidin ($C_{10}H_{12}O_4$), the properties of which are briefly described, and which is extracted from the adults, eggs and larvae of Meloid beetles. Some Arthropods are proof against it, and Pavlovskiĭ has recorded that dried Meloid beetles (cantharides) are attacked by *Sitodrepa panicea*, L., *Anthrenus verbasci*, L. (*varius*, F.), *Ptinus fur*, L., *Cryptophagus cellaris*, Scop., *Dermestes lardarius*, L., and various mites. Experiments on its insecticidal properties were made on larvae of *Lymantria* (*Liparis*) *monacha*, L., on pine-needles, the crystals being well ground up with french chalk to form dusts with cantharidin contents of 1, 0·5, 0·25 and 0·1 per cent., respectively. When dusted with 1 per cent. cantharidin, the larvae at first appeared unaffected, but became restless after a few hours and ceased to feed or eject excreta after 18 hours. The next day some were lying dead or partly paralysed on the floor of the cage, but the majority were hanging head-downwards from the pine-needles, in which position they died. In other experiments, all adults of *Anomala* (*Phyllopertha*) *horticola*, L., and *Pyrrhocoris apterus*, L., and larvae of *Malacosoma neustria*, L., and nearly all second-instar nymphs of *Carausius morosus*, F., were killed by cantharidin at 1 per cent. strength. It is concluded that in these cases cantharidin acted a nerve-poison, but further experiments on *Bombyx mori*, L., and *C. morosus*, showed that it is also effective as a stomach-poison. Dusts containing 1 per cent. cantharidin did not usually injure plants, though very heavily dusted leaves showed slight traces of discolouration.

Powdered Russian cantharides (*Lytta vesicatoria*, L.), containing 3 per cent. cantharidin, was mixed at rates of 5 and 10 per cent. with an inert carrier. The weaker dust was ineffective against larvae of *L. monacha*, but the stronger one killed them as well as those of *Dendrolimus pini*, L., if heavily applied. At a concentration of 10 per cent., Chinese cantharides, *Mylabris* (*Zonabris*) *cichorii*, L., and *M.* (*Z.*) *phalerata*, Pall., containing 1·4 per cent. cantharidin, gave 100 per cent. mortality of *L. monacha* if dusted heavily, and 30–50 per cent. if dusted sparingly, while at 20 per cent. strength, it was fully effective even if dusted sparingly.

Plants dusted with a powder containing 1 per cent. cantharidin attracted *Anthomyia pluvialis*, L., the Anthicid, *Notoxus monoceros*, L., the Ceratopogonid, *Atrichopogon* (*Kempia*) *brunnipes*, Mg., and the Braconid, *Perilitus plumicornis*, Ruthe. These insects were noticeably excited and, with the exception of *P. plumicornis* (which followed *N. monoceros* to parasitise it), fed eagerly on the powder without ill effects. Notes on the biology of these and some other " canthariphilous " insects are given, and the possible reasons for their attraction are discussed.

KORSCHEFSKY (R.). **Beobachtungen an** *Meloe violaceus* **L. and** *Notoxus monoceros* **L.** [Observations on *M. violaceus* and *N. monoceros*.]—*Arb. physiol. angew. Ent. Berl.* **4** no. 2 pp. 157–158. Berlin, May 1937.

Supplementary to the preceding paper, the author records *Notoxus monoceros*, L., and the Ceratopogonid, *Atrichopogon* (*Atochopogon*) *rostratus*, Winn., as attracted by and feeding on the dead bodies of three adults of *Meloë violaceus*, Marsh., in Germany.

FISCHER (W.). **Mineralöle im Pflanzenschutz I.** [Mineral Oils in Plant Protection, I.]—*NachrBl. dtsch. PflSchDienst* **15** no. 11 pp. 102–104. Berlin, November 1935.

ROTHE (G.). **Mineralöle im Pflanzenschutz II.**—*Op. cit.* **17** no. 6 pp. 46–48. June 1937.

The first paper comprises a brief survey of information on the nature of mineral oils used in plant protection work and on the preparation of emulsions from them. In the second are given the results of some preliminary tests made in the Lower Elbe fruit-growing districts with various petroleum oils, of which those used against insects were a miscible oil for winter use and a stock emulsion for summer use. The characteristics of these are not stated. Spraying with the miscible oil at 5 per cent. strength killed only 61 per cent. of the eggs of *Psylla mali*, Schm., a result inferior to that obtained with a tar distillate (fruit-tree carbolineum). Against *Anthonomus pomorum*, L., 6 per cent. miscible oil gave a better result than 5 per cent. fruit-tree carbolineum, but was inferior to 5 per cent. " Baumspritzmittel " [*cf.* *R.A.E.*, A **24** 797]. Against the woolly apple aphis [*Eriosoma* *lanigerum,* Hsm.], a 10 per cent. miscible oil gave 100 per cent. mortality in the laboratory and good results on the field. The stock emulsion for summer use did not prove reliable in tests against *E. lanigerum, Pieris brassicae,* L., and *Porthetria dispar,* L., when used at a concentration of 5 per cent., unless a contact poison was added to it, but it greatly increased the action of the latter.

Thiem (H.). **Auftreten der Mittelmeerfruchtfliege** (*Ceratitis capitata* **Wied.**) **in Deutschland.** [The Occurrence of the Mediterranean Fruit Fly in Germany.]—*NachrBl. dtsch. PflSchDienst* **17** no. 6 p. 45. Berlin, June, 1937.

Apricots, peaches, pears and apples in some German orchards were infested by *Ceratitis capitata,* Wied., in the summer and autumn of 1936. In a few cases, infestation was noticed in 1935, and there was one record in 1934. No danger is apprehended, however, as observations in other countries indicate that the eggs, larvae and pupae are killed by exposure for a fortnight to temperatures near freezing point.

Meyer (E.). **Beobachtungen über "Weizenwanzen" in der Kölner Bucht.** [Observations on Pentatomids infesting Wheat in the Cologne Lowlands.]—*Z. PflKrankh.* **47** no. 6 pp. 321–338, 7 figs., 15 refs. Stuttgart, 1937.

Infestation of wheat by Pentatomids attracted attention in the district of Bonn in 1935, and observations in 1936 showed that it was attacked by *Eurygaster maura,* L., *Aelia acuminata,* L., and *Dolycoris baccarum,* L., both in the Rhineland and in Bavaria. Details of the ecology and food-plants and notes on the life-history of the first two are given. They attacked the seeds of wheat from the milk stage until harvest maturity.

E. maura was polyphagous, and adults and nymphs changing their food-plants in search of those with ripening seeds. A list is given of the cereals (wheat and oats), grasses and Dicotyledons infested by it. It was always found in sunny, sheltered situations, occurring on grasses in early summer and then migrating to the slower-maturing Dicotyledons. Differences in moisture did not seem important. The Scelionid, *Microphanurus semistriatus,* Nees, which is known to parasitise the eggs of *Eurygaster* in Russia [*R.A.E.*, A **1** 449] was reared from those of *E. maura* in the Rhineland and bred in the laboratory, eggs of *A. acuminata* being parasitised experimentally.

A. acuminata also fed chiefly on seeds, but definitely preferred graminaceous plants. It was less numerous than *B. maura,* but more uniformly distributed. Both species often occurred together, but only once, in Bavaria, was *A. acuminata* predominant. Its development seemed to lag behind that of *E. maura,* both nymphs and adults appearing some days later. It was parasitised by the Muscid, *Cistogaster globosa* and an unidentified mite, and some dead individuals were found in nature covered with a fungus. In the laboratory at 20–22°C. [68–71·6°F.] the egg-stage of *E. maura* and *A. acuminata* lasted 7–8 and 9–10 days, respectively, and the nymphal stage about 7 and 6 weeks.

MENOZZI (C.). **Les applications de la lutte artificielle et biologique pour combattre les insectes les plus dommageables à la culture de la betterave en Italie.**—*Publ. Inst. belge Amélior. Better.* **4** no. 6 repr. 19 pp., 15 figs. Brussels, 1937.

This paper comprises an account of the bionomics of *Cleonus* (*Conorrhynchus*) *mendicus*, Gyll., *Cassida vittata*, Vill., and *C. nobilis*, L., on sugar-beet in Italy, together with brief notes on their parasites and recommendations for their control [*cf. R.A.E.*, A **24** 34, 361, etc.].

FORD (J.). **Research on Populations of** *Tribolium confusum* **and its Bearing on ecological Theory: a Summary.**—*J. Anim. Ecol.* **6** no. 1 pp. 1–14, 1 fig., 26 refs. Cambridge, May 1937.

In this paper the work of T. Park [*R.A.E.*, A **24** 613, etc.] and others [**19** 209; **21** 314; **22** 64, 591, 664; **23** 104; etc.] on populations of the flour beetle, *Tribolium confusum*, Duv., is reviewed, and the chief characteristics of natural populations are discussed.

The following is taken from the author's summary: In its growth, the population tends to take the form of the logistic curve. This curve expresses a tendency to geometrical increase, which is less and less realised as the population approaches saturation, owing to the increase in environmental resistance with increasing density. Such a form of population growth is only manifested in unmodified form under constant physical conditions and where there are no interspecific effects. In nature, a variable physical environment causes modifications, which are brought about in many ways. In *Tribolium* it has been shown that alteration in the external environment may change rates of growth, perhaps with opposite effects in different stages of the life-cycle; it may likewise affect the amount of crowding that is the optimum for rate of increase of the population. Under constant conditions, any population imposes on itself a limit to increase and eventually reaches a state of relative stability about which it fluctuates. With a natural population that has reached equilibrium, changes in the physical environment may alter the value of this stable density, and the population proceeds to readjust itself. Alternatively, the population may so alter the environment by its own activity as to make yet other disturbances of the equilibrium. Provided that the environment permits the species concerned to live and reproduce, the factors immediately controlling the growth and behaviour of its population are biotic and proceed either from within the population itself or from without by the action of competing species. These biotic factors are themselves modified in intensity or in kind by external changes in physical factors.

HEFLEY (H. M.). **The Relations of some Native Insects to introduced Food Plants.**—*J. Anim. Ecol.* **6** no. 1 pp. 138–144, 11 refs. Cambridge, May 1937.

The author discusses the change of food-plants of the insect fauna on part of a flood plain in Oklahoma where *Tamarix gallica* and *Melilotus alba* have, since 1906, become very abundant at the expense of the primitive flora. Of 84 species of native insects collected on the tamarisk and sweet clover, 7 and 6, respectively, occurred in considerable numbers on these two plants and apparently preferred them to their original food, Homoptera showing the greatest affinity for them, while chewing insects, such as Coleoptera and Orthoptera, were less marked in their preference. It is suggested that the reasons for insects leaving native for introduced food-plants, may be either active food-selection or the development of resistance in the native food-plant during the long period that it has been subject to infestation by the insect concerned. It would seem that such resistance might be evolved in the case of sucking insects that inject salivary juices into the plants, but not in the case of chewing insects.

LYSAGHT (A. M.). **An ecological Study of a Thrips** (*Aptinothrips rufus*) **and its Nematode Parasite** (*Anguillulina aptini*).—*J. Anim. Ecol.* **6** no. 1 pp. 169–192, 7 diagr., 28 refs. Cambridge, May 1937.

Observations were made for two years on the distribution of the Nematode, *Anguillulina aptini*, Sharga, parasitising *Aptinothrips rufus*, Gmelin [*R.A.E.*, A **24** 458], in Hertfordshire, on a number of grass plots that had undergone different manurial treatments. In August 1934, parasitism rose to 64 per cent. on one plot and averaged 32 per cent. for the 11 under observation. In 9 plots the herbage was mixed, but in the 2 others, where *Holcus lanatus* predominated almost or entirely, parasitism never rose above 4 per cent. Infested thrips were, however, bred on a less sturdy growth of *H. lanatus* under greenhouse conditions. The parasitised thrips were almost always sterile, but fluctuations in their population were not correlated with parasitism.

Entomology.—*Rep. Dep. Agric. Punjab* ***1935–36*** pp. 51–55. Lahore, 1937.

No serious outbreak of any insect pest of economic importance in the Punjab was reported in the year ending June 1936. Further study of the incidence of white fly [*Bemisia gossypiperda*, Misra & Lamba] on cotton showed that the average attack was lowest on soil treated with ferrous sulphate at the rate of about 820 lb. per acre. Reductions of the population of *Pyrilla* spp. on sugar cane were mainly due to the Stylopid parasite, *Pyrilloxenos compactus*, Pierce [*cf. R.A.E.*, A **25** 45], to hot winds in May and June, to the drying up of the leaves as the crop ripens and to the burning of ratoon cane. For oviposition, soft broad-leaved varieties were preferred to those with narrow non-succulent leaves. The Lygaeid, *Macropes excavatus*, Dist., is increasing in numbers on sugar cane. The life-cycle ot the woolly aphis [*Eriosoma lanigerum*, Hsm.] on apple occupied 8–13 days in May and 90–93 in the winter.

KING (C. B. R.). **The Tortrix Problem.**—*Tea Quart.* **10** pt. 1 pp. 46–53, 1 graph, 3 refs. Talawakelle, Ceylon, March 1937.

In this review of control measures tried against the tea tortrix [*Homona coffearia*, Nietn.] in Ceylon [*cf. R.A.E.*, A **15** 218 ; **22** 166], it is concluded that the only feasible one is the systematic collection of egg-masses at the times of their greatest abundance, which are known from graphs compiled from regular collections over some years. A plan for such a systematic collection is summarised. This provides that collections should be made during August, from mid-October to mid-November, and from mid-December to February; that they can be confined to tea that has not been pruned for 9 months and is not about to be pruned, unless observation shows them to be required on younger tea; and that, as the incubation period of the eggs is 8–10 days, collections should cover the same ground every 7–8 days.

KATÔ (M.). **A statistical Investigation of the Correlation between Climatic Conditions and the Egg-laying Activity of the Strawberry Weevil,** *Anthonomus bisignifer* **Schenkling.**—*Sci. Rep. Tôhoku Univ.* (4) **11** no. 3 pp. 307–321, 6 figs., 9 refs. Sendai, February 1937. **Changes occurring in the Egg-laying Activity of the Strawberry Weevil,** *Anthonomus bisignifer* **Schenkling, in the Case of a Solar Eclipse.**—*T.c.* no. 4 pp. 353–359, 2 figs., 2 refs.

In the first paper, which deals with the relation between climate and oviposition of *Anthonomus bisignifer*, Schenk., on strawberry in Japan [*cf. R.A.E.*, A **24** 571], it is shown that, of the climatic factors measured, *viz.*, total radiant energy, soil surface temperature, air temperature about a foot above the soil surface, rainfall, humidity and evaporation, oviposition was controlled mainly by the first two during the daytime, and was distinctly correlated with evaporation during the night. The observations described in the second paper show that oviposition decreased markedly during the eclipse, probably owing to the decrease of solar radiation.

SCHEDL (K. E.). **Scolytidae and Platypodidae. Contribution 35. The Collection of the South Australian Museum.**—*Rec. S. Aust. Mus.* **5** no. 4 pp. 513–535, 2 figs. Adelaide, November 1936. [Recd. May 1937.]

This is a review of the Scolytids and Platypids represented in the collection of the South Australian Museum. The author considers *Crossotarsus grevilleae*, Lea, to be a synonym of *Diapus pusillimus*, Chap. Of the 20 new species described, the only ones of which the food-plants are recorded are *Platypus queenslandi* from walnut in Queensland, and *Dryocoetes dimorphus* from *Pittosporum* in New South Wales.

ZECK (E. H.). **The Cherry Aphid** (*Myzus cerasi* **Fab.**). **Further Investigations and Experiments.**—*Agric. Gaz. N.S.W.* **48** pt. 4 pp. 216–218, 4 figs., 1 ref. Sydney, April 1937.

In spraying experiments against *Myzus cerasi*, F., on cherry in New South Wales [*cf. R.A.E.*, A **24** 598], counts made on 30th November 1936 showed that 83 Aphid-infested clusters were present per row of 10 trees on an untreated row. Where tar distillate (1 : 35) had been applied as a dormant spray and ovicide on 7th July, no infestation occurred. A single dormant spray of red oil (1 : 20), applied on the same date, was not effective, 53 infested clusters being found in a row, but when it was followed by nicotine sulphate (1 : 600) in either the pinking or in this and the sepal-fall stages, the numbers were reduced to 3 in each row; they were 7 and 6, respectively, where nicotine sulphate was used alone.

Jack (H. W.). **The Giant Toad** (*Bufo marinus*).—*Agric. J. Fiji* **8** no. 2 p. 4. Suva, 1936.

Early in 1936, a colony of *Bufo marinus*, which is known to destroy a variety of noxious insects, was introduced into Fiji from Hawaii, where it has recently been established [*cf. R.A.E.*, A **21** 235]. The toads were successfully reared, and some were liberated in May and June in several localities, where they appear to be thriving.

Taylor (T. H. C.). **The Biological Control of the Coconut Leaf-miner** (*Promecotheca reichei*, **Baly) in Fiji.**—*Agric. J. Fiji* **8** no. 2 pp. 17–21. Suva, 1936.

A brief account is given of the bionomics of *Promecotheca reichei*, Baly, on coconut in Fiji, the way the equilibrium between it and indigenous parasites was upset by *Pediculoides ventricosus*, Newp., so that it became very injurious, particularly on the Lau Islands, where a dry season occurs that is favourable to the mite, and its successful control by an introduced parasite, *Pleurotropis parvulus*, Ferrière [*cf. R.A.E.*, A **25** 191]. By May 1934, complete control of *P. reichei* was obtained in the Lau Islands, about 5,000 parasites emerging per tree each day when the population was at its maximum. In some small islands, *Pleurotropis* so completely destroyed its host as to cause its own extermination. On one island, an outbreak of the pest has recurred since it was suppressed by the introduction of *Pleurotropis* in 1933, probably for this reason.

Simmonds (H. W.). **Entomological Notes.**—*Agric. J. Fiji* **8** no. 2 p. 43. Suva, 1936.

The Eulophid, *Tetrastichus giffardianus*, Silv., which was introduced into Fiji against fruitflies [*Dacus* spp.] in 1935 [*R.A.E.*, A **24** 447, 768] was recovered in March 1936 in a district where it had been liberated in the previous September, having survived 5 months of extremely wet weather. In another locality, it was recovered in September after a dry period of 5 months.

Risbec (J.). **Observations sur les parasites des plantes cultivées aux Nouvelles-Hébrides.**—*Faune Colon. franç.* **6** fasc. 1, 214 pp., frontis., 2 pls., 272 figs. Paris, Soc. Edit. géogr. marit. colon, 1937.

In this work are recorded a large number of insects that attack or are associated with coconut, coffee, banana, orange and other plants cultivated in the New Hebrides. Figures, descriptions and notes on the bionomics of many are given, together with brief recommendations for control, and the types of damage by the more important pests are described.

Solomon (M. E.). **Description and Life-history of a new Western Australian Psyllid.**—*J. roy. Soc. W. Aust.* **22** (1935–36) pp. 41–48, 2 pls., 7 refs. Perth, 1936. [Recd. May 1937.]

All stages of the Psyllid, *Spondyliaspis occidentalis*, sp. n., from *Eucalyptus gomphocephala* in Western Australia are described. The whole life-cycle is passed on the twigs and foliage of the food-plant and is completed in a few weeks in summer.

Esaki (Teiso) & Hashimoto (Shiro). **Studies on Rice Leaf-hoppers. I. Biology and Natural Enemies.** [*In Japanese.*]—*Nojikairyo-shiryo Minist. Agric. Japan* no. 127, [16] 135 + [4] pp., 15 pls., text ill. Fukuoka, Japan, March 1937.

This paper recapitulates work on the leaf-hoppers injurious to rice in Japan that was carried out from 1929 to 1933 and noticed from the progress reports [*R.A.E.*, A **25** 380, etc.]. Those of most economic importance are the Jassids, *Nephotettix bipunctatus cincticeps*, Uhler, and *Deltocephalus dorsalis*, Motsch., and the Delphacids, *Delphacodes striatellus*, Fall., *Sogota furcifera*, Horv., and *Nilaparvata oryzae*, Mats.

Lui (Ho-chang). **Notes on the Investigation of the Pine Caterpillar (*Dendrolimus* sp.) in the Forestry Experiment Station, Li Shui Hsien, Chekiang.** [*In Chinese.*]—*Ent. & Phytopath.* **5** no. 13 pp. 240–246, 1 map. Hangchow, 1st May 1937. (With a Summary in English.)

During the past few years, pine trees in Chekiang have been attacked by *Dendrolimus* sp. In the spring of 1937, a serious outbreak occurred, the infested area covering about 135 acres. Natural enemies found were a Braconid, *Rhogas spectabilis*, Mats., an Ichneumonid of the genus *Rhythmonotus*, a Reduviid bug and a fungus. This moth develops best in a high, dry, sunny situation.

Tsai (P. H.) & Chun (N. M.). **Some Notes on the Natural Enemy, Sexuality, and other Characteristics of the Paddy Skipper (*Parnara guttata* Bremer) observed during the Autumn of 1936, Nanking.** [*In Chinese.*]—*Ent. & Phytopath.* **5** no. 14 pp. 262–273, 10 figs., 4 refs. Hangchow, 11th May 1937. (With a Summary in English.)

Parnara guttata, Brem., became rapidly more abundant on rice in the Provinces of Kiangsu, Chekiang and Anhwei in 1936. The results are here given of the authors' investigations on it, together with some conclusions arrived at by other workers. In the Nanking section, 4 larval and 9 pupal parasites were observed, the most abundant of the latter being a new species of *Pleurotropis*. Parasitism of pupae was so high in the autumn of 1936 that only 18·81 per cent. emerged. Each individual rolled up 3–12 leaves, the average number being 6·31. The average number of nests made on rice leaves was 79·15 per 100 hills. In 110 adults dissected, the percentage of males was 52·73. Late rice was most severely damaged, especially late varieties of *indica*. In addition to rice, 9 common plants, of which 8 are graminaceous, were attacked.

Tsai (Pang-hwa) & Tong (Chu-yün). **A new Method of Surveying the Damage by Rice Borers.**—*Ent. & Phytopath.* **5** no. 17 pp. 328–336, 2 figs., 1 ref. Hangchow, 11th June 1937. (With a Summary in English.)

The following is based on the authors' summary : The recognised method of estimating the damage by rice borers during the autumn harvest is to calculate the rate of white heads or the rate of borer infestation according to the number of white heads or of bored stems, respectively, while the rice is still growing in the field. But no adequate method has so far been known of estimating the damage by borers after the harvest. The method evolved by the authors, which is illustrated by tables and graphs, is based on the application of the regression line of hibernating rice borer larvae. The number of larvae hibernating in the stubble and stems over a small space is calculated and then multiplied to give the number of larvae per unit of area. The rate of borer infestation can thus be obtained.

CHIN (Meng-hsiao). **Biology of the Bamboo Zygaenid,** *Artona funeralis* **Butler, in Hangchow.**—*Ent. & Phytopath.* **5** no. 17 pp. 336–345, 5 figs. Hangchow, 11th June 1937. (With a Summary in English.)

The following is taken from the author's summary: The Zygaenid, *Artona funeralis*, Btlr., is an important pest of bamboo [*cf. R.A.E.*, A **14** 143; **24** 808] in Hangchow, and its larvae sometimes defoliate more than 80 per cent. of the trees. The first signs of attack are pale patches and stripes on the leaves, which are later entirely destroyed. The production of shoots is thus greatly decreased, and in some cases the plants are killed.

A. funeralis has three generations a year and hibernates in the larval stages in a greyish cocoon on walls or in other sheltered places. The adults appear in the second half of May, in July and again in September. They are active during the day and quiescent at night. The egg-masses are laid on the lower surface of the leaves. The newly-hatched larvae feed gregariously on the mesophyll (not on the epidermis), and in the third instar they eat the entire leaves. About 40 per cent. of the larvae and pupae are parasitised by Hymenoptera and Diptera.

Effective control measures against this pest are spraying or dusting with contact or stomach poisons, and the early destruction of infested leaves.

MENDES (L. O. T.). **A "Lagarta das maçãs do algodoeiro"**—*Chloridea virescens* **(Fab.).** [The Cotton Boll Worm—*Heliothis virescens*, F.]—*Bol. tech. Inst. agron. Campinas* no. 28, 11 pp., 2 pls., 8 refs. Piracicaba, 1937. (From *Rev. Agric.* **12** no. 3–4, 1937.) (With a Summary in English.)

The Noctuid, *Heliothis* (*Chloridea*) *virescens*, F., was observed in 1936, causing 100 per cent. infestation of cotton in S. Paulo, Brazil, the flower buds and bolls being chiefly attacked, and sometimes also the leaves and squares. The buds and squares were often completely destroyed. Descriptions of all stages and of the life-cycle are taken from a paper already noticed [*R.A.E.*, A **15** 628]. The larvae were parasitised by a fly, probably *Sarcophaga lambens*, Wied. (*sternodontis*, Towns). Spraying with lead arsenate is suggested for control.

SCARONE (F.). **Les plantes à roténone.**—*Agron. colon.* nos. 231–232, pp. 79–86, 107–118, 1 fig., 19 refs. Paris, 1937.

With a view to furthering the production in French colonies and dependencies of *Derris*, *Lonchocarpus* and other plants containing fish-poisons that are used as insecticides, their occurrence and cultivation in various parts of the world, their manufacture, properties, uses and commercial possibilities are discussed from the literature.

von Lengerken (H.). **Die Bedeutung der Aaskäfer für Land- und Forstwirtschaft.** [The Importance of Silphid Beetles in Agriculture and Forestry.]—*Ent. Bl.* **33** no. 2 pp. 141–145, 1 fig., 4 refs. Krefeld, May 1937.

A popular account is given of the feeding habits of the commoner species of Silphid beetles [*cf. R.A.E.*, A **16** 58, 59; **17** 326; **18** 434]. Larvae and adults of *Silpha* (*Blitophaga*) *undata*, Müll., and *S.* (*B.*) *opaca*, L. [*cf.* **17** 326] do considerable damage to the leaves of sugar-beet, sometimes causing the plants to die in dry weather.

Crowell (M. F.) & McCay (C. M.). **Nutritional Studies of the Webbing Clothes Moth** *Tineola bisselliella* **Hum.**—*Physiol. Zoöl.* **10** no. 3 pp. 368–372, 11 refs. Chicago, Ill., July 1937.

The following are the authors' conclusions : The nutritional requirements of the webbing clothes moth, in spite of its peculiar feeding habits in nature, may be satisfied by a purified diet consisting of casein, lactalbumin, Harris B concentrate, and fish-meal ash. The value of the fish-meal ash is questionable. Part, or all, of the vitamin-B complex is essential for the growth and development of *Tineola bisselliella*, which requires neither fat nor the fat-soluble vitamins. Purified casein is not an adequate protein for the optimum development of the larvae. Purified lactalbumin supplements the casein satisfactorily. The addition of cystine to the casein does not markedly improve its quality.

Papers noticed by Title only.

Cook (M. T.). **Insect Transmission of Virus Diseases of Plants.**—*Sci. Mon.* **44** pt. 2 pp. 174–177. New York, 1936. [A summary of the literature.]

Delong (D. M.) & Davidson (R. H.). **Methods in Study and Preservation of Leafhopper Genitalia.**—*J. econ. Ent.* **30** no. 2 pp. 372–374, 1 fig. Menasha, Wis., April 1937.

Ludwig (D.). **The Effect of Different Relative Humidities on Respiratory Metabolism and Survival of the Grasshopper** *Chortophaga viridifasciata* **De Geer.**—*Physiol. Zoöl.* **10** no. 3 pp. 342–351, 2 figs., 15 refs. Chicago, Ill., July 1937.

Mathur (C. B.) & Soni (B. N.). **Studies on** *Schistocerca gregaria* **Forsk. IX. Some Observations on the Histology of the Blood of the Desert Locust.**—*Indian J. agric. Sci.* **7** pt. 2 pp. 317–325, 2 pls., 13 refs. New Delhi, April 1937.

Hertz (M.) & Imms (A. D.). **On the Responses of the African Migratory Locust** [*Locusta migratoria migratorioides*, **R. & F.**] **to different Types of Background.**—*Proc. roy. Soc.* (B) **122** no. 828 pp. 281–297, 3 figs., 5 refs. London, May 1937.

Bhatia (M. L.). **On** *Adelina tribolii*, **a Coccidian Parasite of** *Tribolium ferrugineum* **F.** [*castaneum*, Hbst.]—*Parasitology* **29** no. 2 pp. 239–246, 19 figs., 2 pls., 8 refs. London, April 1937. [*Cf. R.A.E.* A **22** 64].

HALL (W. J.). **Observations on the Coccidae of Southern Rhodesia. VIII.** [including 8 new species and 1 new variety].—*Trans. R. ent. Soc. Lond.* **86** pt. 8 pp. 119–134, 9 figs., many refs. London, May 1937. [*Cf. R.A.E.*, A **23** 687.]

TAKAHASHI (R.). **Some Oriental Aphididae (Hemiptera), II** [including a new species from Mauritius and a new species of a new genus from Japan].—*Konowia* **16** no. 1 pp. 90–96, 2 figs. Vienna, May 1937.

ABE (Y.). **On the Distribution of the Oriental Termite,** *Coptotermes formosanus* **Shiraki, in Japan.**—*Sci. Rep. Tôhoku Univ.* (4) **11** no. 4 pp. 463–472, 3 maps, 47 refs. Sendai, April 1937.

[PYATNITZKIĬ (G. K.).] **Пятницкий (Г. К.). Weather Conditions and the Forecasting of the Development of** *Loxostege sticticalis* **L.** [*In Russian.*]—*Bull. Plant Prot.* (1) no. 15, 68 pp., 27 figs., 30 refs. Leningrad, 1936. (With a Summary in English.) Price 2 *rub.* 50 *kop.* [*Cf. R.A.E.*, A **22** 373.]

POLIZU (S.). **Fauna Afidelor din Basarabia.** [The Aphid Fauna of Bessarabia, 40 Species.]—*Rev. ştiinţ. V. Adamachi* 1936 no. 3–4 pp. 170–171. Jassy, 1936.

RUSSO (G.). **V. Contributo alla conoscenza dei Coleotteri Scolitidi. Fleotribo** : *Phloeotribus scarabaeoides* **(Bern.) Fauv. Parte prima.** [Fifth Contribution to the Knowledge of the Scolytids. *P. scarabaeoides*, Bern. Part I. (Morphology, anatomy, histology).] —*Boll. Lab. Ent. agrar. Portici* **1** pp. 1–262, 2 pls., 126 groups of figs., 8 pp. refs. Portici, 19th March 1937.

TISCHLER (W.). **Schadauftreten von Wanzen an Getreide.** [The injurious Occurrence of Pentatomids on Cereals in Germany.]—*Kranke Pflanze* **14** no. 6 pp. 106–108, 1 pl. Dresden, June 1937. [*Cf. R.A.E.*, A **25** 308, 584.]

NEVES (M.). **Contribution à l'étude des Coccides du Portugal. II.**—*Bull. Soc. portug. Sci. nat.* **12** no. 15 pp. 119–120, 1 ref. **III.**—*T.c.* no. 22 pp. 171–173. Lisbon, 1936. [Recd. June 1937.]

GOUX (L.). **Notes sur les Coccides (Hem.) de la France (18e note). Six espèces nouvelles pour la France et remarques sur les genres** *Lecanopsis, Exaeretopus* **et** *Luzulaspis.*—*Bull Soc. ent. Fr.* **42** no. 6 pp. 93–96, many refs. Paris, 1937.

TROUVELOT (B.). **Nouvelles connaissances acquises sur le Doryphore** [a review of recently published data on *Leptinotarsa decemlineata*, Say, on potato in France.]—*Rev. Agric. Fr.* **69** no. 5 pp. 188–191, 5 refs., 2 figs. Paris, May 1937.

BUSNEL (R. G.) & DRILHON (A.). **Etude biochimique du** *Leptinotarsa decemlineata* **Say pendant l'hivernation** [a study of the water and fat contents].—*C. R. Soc. Biol.* **124** no. 10 pp. 916–917. Paris, 1937.

PRAVIEL (G.). **Notes sur la morphologie externe du carpocapse du pommier** (*Laspeyresia* [*Cydia*] *pomonella* **L.**).—*Rev. Path. vég.* **24** fasc. 2 pp. 112–120, 3 pls. Paris, 1937.

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